Characterization and biological stabilization of fine fraction from landfill mining

Landfilling has been the major method to dispose waste for the decades, thus there are thousands of landfills around the world. Landfills contain large amount of resources, which could be used as material or energy. There is an increasing interest for landfill mining which means excavation and processing of waste materials mined from landfills. While previous landfill composition studies have focused especially on metal recovery and combustible materials, they have shown that landfills contain significant amounts of soil type material with small particle size, referred as fine fraction (FF). As redisposal of FF after landfill mining is expensive and causes emissions for decades, FF should be treated to increase value for reuse. The aim of this thesis was to assess in details the characteristics of the FF and to evaluate the effects of different biological treatment methods on stability and characteristics of FF. In this study, FF was sampled from two landfills representing different eras of material consumption and waste management practices: Kuopio, landfilled 2001–2011, and Lohja, landfilled 1967–1989.

The Kuopio landfill was found to contain 38–54 % of FF (< 20 mm) and the Lohja landfill 40–74%. FF contains in various amounts of organic matter (VS 6–27% of TS), nutrients (1.4–8 kg N/t TS, 1–1.5 kg P/t TS) and soluble organic compounds (e.g. 0.5–4.6 kg COD/t TS). The organic matter content, biomethane potential (0.4–27 L CH4/kg TS) and respiration activity (1.4–2.4 g O2/kg TS) were detected to be higher in top layer of new landfill (1–5 years old) while bottom layer of new landfill (6–10 years old) was similar to old landfill (24–46 years old). Biological activity may limit the utilization of FF after landfill mining, thus FF needs to be stabilized to reduce biological activity. Furthermore, FF may also contain hazardous compounds, which needs to be assessed when evaluating the use of FF.

To reduce biological activity of FF, the anaerobic and aerobic stabilization of FF were studied in two laboratory experiments employing simultaneous four leach bed reactors operated for 173–180 days. In anaerobic stabilization, methane production was found to range from 9 to 18 m3 CH4/t VS for FFs from both landfills. Irrigation of FF was necessary for efficient methane production while sludge addition providing both moisture and inoculum deteriorated the characteristics of FF.

Aerobic stabilization reduced more efficiently organic matter content and biological activity from FF compared with anaerobic treatment. Ammonium nitrogen in the leachate was removed rapidly in aerobic treatment due to nitrification. Organic matter and soluble compounds were efficiently removed with continuous water adding, regardless of anaerobic and aerobic conditions, while leachate recirculation introduced those back to the reactor. The scaling up of the anaerobic and aerobic stabilization methods of FF showed that applied technology, for example aeration or irrigation method, and size of treatment area have major effects on the costs of FF treatment. However, anaerobic stabilization and aerobic stabilization with passive aeration without continuous irrigation would have similar costs in similar sites.

In conclusion, FF may need stabilization due to organic matter content and biological activity before utilization. Both anaerobic and aerobic stabilization improved the quality of FF by reducing organic matter content and biological activity. Both treatment methods can be used in full scale stabilization of FF. The treatment of FF has potential to increase the value and usability of FF. Treatment concept and technology should be further optimized in pilot and full scales.

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Ultralong 20 Milliseconds Charge Separation Lifetime for Photoilluminated Oligophenylenevinylene–Azafullerene Systems

The synthesis and characterization of oligophenylenevinylene (OPV)–azafullerene (C59N) systems in the form of OPV–C59N donor–acceptor dyad 1 and C59N–OPV–C59N acceptor–donor–acceptor triad 2 is accomplished.
Photoinduced electronic interactions between OPV and C59N within 1 and 2 are assessed by UV–vis and photoluminescence. The redox properties of 1 and 2 are investigated, revealing a set of one-electron oxidation and three one-electron reduction processes owed to OPV and C59N, respectively. The electrochemical bandgap for 1 and 2 is calculated as 1.44 and 1.53 eV, respectively, and the free energy for the formation of the charge-separated state for 1 and 2 via the singlet-excited state of OPV is found negative, proving a thermodynamically favorable process. Photoexcitation assays are performed in toluene and o-dichlorobenzene (oDCB) and the reactions are monitored with time-resolved absorption and emission spectroscopies. Competitive photoinduced energy and electron transfer are identified to occur in both systems, with the former being dominant in 2. Markedly, the charge-separated state in oDCB exhibits a much longer lifetime compared to that in toluene, reaching 20 ms for 1, the highest ever reported value for fullerene-based materials. These unprecedented results are rationalized by considering conformational phenomena affecting the charge-separated state.

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**Cellulose Nanofiber Alignment Using Evaporation-Induced Droplet-Casting, and Cell Alignment on Aligned Nanocellulose Surfaces**

This work investigates droplet-evaporated cellulose nanofiber (CNF) alignment and cell responses on CNF surfaces. Surfaces of unmodified (u-), anionic (a-), and cationic (c-) CNFs were fabricated using an evaporation-induced droplet-casting method and characterized in terms of degree of orientation. Circular variance (CV) values obtained using Cytospectre software to analyze the degree of orientation from AFM images showed a significantly higher degree of orientation on c- and u-CNF surfaces (average CV 0.27 and 0.24, respectively) compared to a-CNF surfaces (average CV 0.76). Quantitative analysis of surface roughness plots obtained from AFM images confirmed the difference between the direction of alignment versus the direction perpendicular to alignment. AFM images as well as observations during droplet evaporation indicated c-CNF alignment parallel to a dry-boundary line during droplet evaporation. Fibroblasts were cultured on the u-, a-, and c-CNF surfaces with or without a fibronectin (FN) coating for 48 h, and the cell response was evaluated in terms of cell viability, proliferation, morphology, and degree of orientation. Cell viability and proliferation were
comparable to that on a control surface on the a-CNF and c-CNF surfaces. Although an FN coating slightly enhanced cell growth on the studied surfaces, uncoated a-CNF and c-CNF surfaces were able to support cell growth as well. The results showed cell orientation on aligned c-CNF surfaces, a finding that could be further utilized when guiding the growth of cells. We also showed that the alignment direction of c-CNFs and thus the cell orientation direction can be controlled with a contact-dispensing technique.

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**Technology Development and Techno-Economic Analysis of Hydrogen Production by Thermal Decomposition of Methane**
The transition to the hydrogen economy has been proposed as a sustainable solution for the simultaneous depletion of fossil fuels and the increase in global energy demand since the 1970s. However, the current fossil fuel-based hydrogen production causes significant CO2 emissions. On the other hand, extensive hydrogen production by water electrolysis powered by renewable electricity requires a remarkable increase in the renewable electricity generation capacity. Therefore, alternative solutions are needed in order to promote the hydrogen economy, develop hydrogen infrastructure, and smoothen the transition to the wide-scale renewable-based hydrogen production in the future.

In this work, thermal decomposition of methane (TDM) was studied as a transition period solution towards the hydrogen economy. In TDM, methane is converted to hydrogen and solid carbon thereby avoiding the direct CO2 emissions. A laboratory-scale test reactor was designed and constructed in this work in order to experimentally study the TDM reaction. The experimental results were combined with mathematical modeling to find a suitable TDM reaction mechanism for reactor design studies. A global reaction mechanism with reaction parameters optimized in this study was found applicable for this purpose.
The TDM product carbon utilization possibilities were evaluated by conducting a market survey. According to the experimental TDM studies in the literature, the product carbon from non-catalytic TDM at temperatures above 1450 K is carbon black. Carbon black is mainly utilized in rubber industry and its market value vary from 500 EUR per tonne to 2,000 EUR per tonne depending on the quality. As a part of the technology development, a design path was outlined to assist the selection of the reaction, reactor, and process parameters for a TDM application. The path was followed in this work when potential industrial-scale technology concepts for hydrogen production by TDM were designed. The economic feasibility of these processes was evaluated and comparison was conducted with two other hydrogen production technologies, i.e., steam methane reforming (SMR) and water electrolysis.

According to the economic analysis, a break-even value for the TDM product carbon was found as 310 EUR per tonne of carbon in the current market situation and 280 EUR per tonne of carbon in a potential market situation in 2030 above which the hydrogen production by TDM would be economically feasible in comparison with SMR. The CO2 emissions from the hydrogen production by TDM were considerably lower than in SMR. Electrolysis could provide an economical option for the production of CO2-free hydrogen when it is powered by inexpensive renewable electricity, but its availability is expected to remain limited in the near future. By contrast, the feedstock availability through the existing natural gas network provides a possibility for demand-driven hydrogen production by TDM. Thus, the most suitable application for TDM was identified in this work as small or medium industrial scale on-site hydrogen production, which minimizes hydrogen transportation costs. The TDM technology implementation could be further advanced by creating a sufficiently large market for the product carbon and tightening the CO2 emission regulation.

Free amino acids and 5′-nucleotides in Finnish forest mushrooms
Edible mushrooms are valued because of their umami taste and good nutritional values. Free amino acids, 5′-nucleotides and nucleosides were analyzed from four Nordic forest mushroom species (Lactarius camphoratus, Boletus edulis, Cantharellus cibarius, Craterellus tubaeformis) using high precision liquid chromatography analysis. To our knowledge, these taste components were studied for the first time from Craterellus tubaeformis and Lactarius camphoratus. The focus was on the umami amino acids and 5′-nucleotides. The free amino acid and 5′-nucleotide/nucleoside contents of studied species differed from each other. In all studied samples, umami amino acids were among five major free amino acids. The highest concentration of umami amino acids was on L. camphoratus whereas B. edulis had the highest content of sweet amino acids and C. cibarius had the highest content of bitter amino acids. The content of umami enhancing 5′-nucleotides were low in all studied species.
Time-Resolved Fluorescence Spectroscopy Reveals Fine Structure and Dynamics of Poly(l-lysine) and Polyethylenimine Based DNA Polyplexes

Structural dynamics of the polyethylenimine-DNA and poly(l-lysine)-DNA complexes (polyplexes) was studied by steady-state and time-resolved fluorescence spectroscopy using the fluorescence resonance energy transfer (FRET) technique. During the formation of the DNA polyplexes, the negative phosphate groups (P) of DNA are bound by the positive amine groups (N) of the polymer. At N/P ratio 2, nearly all of the DNA’s P groups are bound by the polymer N groups: These complexes form the core of the polyplexes. The excess polymer, added to this system to increase the N/P ratio to the values giving efficient gene delivery, forms a positively charged shell around the core polyplex. We investigated whether the exchange between the core and shell regions of PEI and PLL polyplexes takes place. Our results demonstrated a clear difference between the two studied polymers. Shell PEI can replace PEIs previously attached to DNA in the polyplex core, while PLL cannot. Such a dynamic structure of PEI polyplexes compared to a more static one found for PLL polyplexes partially explains the observed difference in the DNA transfection efficiency of these polyplexes. Moreover, the time-resolved fluorescence spectroscopy revealed additional details on the structure of PLL polyplexes: In between the core and shell, there is an intermediate layer where both core and shell PPLLs or their parts overlap.
Effect of elevated nitrate and sulfate concentrations on selenate removal by mesophilic anaerobic granular sludge bed reactors

Simultaneous removal of selenate (SeO₄²⁻), nitrate (NO₃⁻) and sulfate (SO₄²⁻), typically present in Se-contaminated wastewaters, by Eerbeek anaerobic granular sludge, was investigated in batch and continuous bioreactor experiments. Batch experiments showed that SeO₄²⁻ removal was enhanced to 91% in simulated wastewater with SeO₄²⁻ : NO₃⁻ : SO₄²⁻ molar ratios) compared to simulated wastewater with SeO₄²⁻ alone (67%). Removal of SeO₄²⁻, NO₃⁻ and SO₄²⁻ at a 1 : 40 : 100 ratio was studied in a 2 L lab-scale upflow anaerobic sludge blanket (UASB) reactor operated at 20 [degree]C, a 24 h hydraulic retention time and a 2 g COD L⁻¹ day⁻¹ organic loading rate using lactate as the electron donor. The removal efficiencies were stabilized at 100, 30 and 80% for NO₃⁻, SO₄²⁻ and total Se, respectively, during 92 days of UASB operation. The total Se removal efficiencies dropped to 47% or even to a negative value when, respectively, SO₄²⁻ and NO₃⁻ were sequentially excluded from the influent. Speciation of Se, particularly the microbial production of colloidal Se₀ levels, was influenced by both SO₄²⁻ and NO₃⁻. The results presented here demonstrate that UASB reactors are capable of removing SeO₄²⁻ in the presence of millimolar concentrations of NO₃⁻ and SO₄²⁻ typically found in Se-contaminated wastewaters.

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Photodynamic self–disinfecting surface using pyridinium phthalocyanine

We have synthesized novel phthalocyanine with four pyridyl substituents connected to α-phthalo-positions via direct C–C bond. The Zn complex and tetracationic derivatives of phthalocyanine were also synthesized and the dyes were impregnated into filter paper to prepare photoactive antimicrobial surface. The photodynamic antimicrobial efficacy of the dyed paper samples was evaluated by a simple and fast setup using bioluminescent microbes, Escherichia coli and Acinetobacter baylyi ADP1 strains carrying bacterial luciferase genes were used in the screening experiment. The most efficient compound, tetracationic zinc derivative 8, was investigated further. The compound was highly water soluble, had high molar absorptivity and exhibited good adhesion to the filter paper without leaching into the solution. The singlet oxygen quantum yield of tetracationic zinc derivative 8 in water was found out to be 30 ± 20%. According to the cell viability assay test performed on E. coli wild type in solution, the molecule had similar or better photo toxicity as the reference photosensitizer, tetraakis (1-methyl-pyridinium-4-yl)porphyrin (TMPyP). Antimicrobial efficacy of the dye 8 on photoactive surface was studied by live cell assessment through colony forming unit (CFU) counting. The colored surface demonstrated 3 log reduction in CFU against E. coli and A. baylyi ADP1 just after 1 h of illumination with the white light of low intensity.

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Comparison of Scenedesmus acuminatus and Chlorella vulgaris cultivation in liquid digestates from anaerobic digestion of pulp and paper industry and municipal wastewater treatment sludge

Two microalgae, Chlorella vulgaris and Scenedesmus acuminatus, were batch cultivated separately in two types of diluted liquid digestates. The first digestate (ADPP) was obtained from a mesophilic laboratory digester treating biosludge from a pulp and paper industry wastewater treatment plant. The second digestate (ADMW) was collected from a full-scale mesophilic anaerobic digester treating mixed municipal wastewater treatment sludge. The highest biomass production (as volatile suspended solids, VSS), 8.2–9.4 g L\(^{-1}\), was obtained with S. acuminatus in ADPP. C. vulgaris in ADMW had the lowest biomass production, reaching 2.0 g L\(^{-1}\). Both microalgae removed ammonium efficiently from ADPP (99.9% removal) while the final ammonium removal efficiencies from ADMW with S. acuminatus and C. vulgaris were only 44.0 and 23.8%, respectively. The phosphate removal efficiencies from both ADPP and ADMW were higher than 96.9% with both microalgae. The highest carbohydrate content (60.5%) was obtained with S. acuminatus cultivated in ADPP. Scenedesmus acuminatus in ADPP showed one of the highest biomass production yields that have been reported for microalgae in real wastewater-derived nutrient sources. Consequently, this combination is promising for developing biorefinery and biofuel applications in the pulp and paper industry.
Photoinduced Charge Separation in Semiconductor-Quantum-Dot/Organic-Molecule Hybrids

Semiconductor colloidal quantum dot/organic molecule nanohybrids are gaining momentum due to the relative ease with which an efficient photoinduced charge transfer in the desired direction can be achieved between the dot and the molecule. At the same time analysis of the experimental studies of such systems, and in particular transient absorption spectroscopy data, is a challenging task because of the statistical nature of hybrid formation and the complex kinetics of the photoreactions. This Minireview aims to find common ground for comparing the photoinduced charge-separation reactions in quantum dot/organic molecule hybrids. It also discusses a common set of parameters which would help to compare different quantum dot/molecule hybrids as well as progress in developing design principles to achieve controllable photoinduced charge separation in such hybrids.

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Carbazole-based small molecule electron donors: Syntheses, characterization, and material properties

Efficient synthetic methods for carbazole-based small molecule electron donors with donor–acceptor (D–A) and A–D–A type structures were developed. In order to study the relation between chemical structures and material properties, the prepared compounds were characterized in detail using absorption spectroscopy, differential pulse voltammetry, and computational methods. In addition, symmetrical A–D–A type compounds were tested as an active layer component in bulk heterojunction based organic solar cell (OSC) devices with conventional structure. The results show that the two compound types have many similar properties. However, the extended molecular structure of A–D–A type compounds offer better film forming properties and higher molar absorption coefficients compared with the D–A type materials. Furthermore, the attachment of fluoro substituents in the A units has a positive effect on all solar cell device parameters. Moreover, the computational studies revealed that the molecular structures are twisted between the central carbazole D unit and π-bridge which may result in inefficient intramolecular charge transfer and, also, relatively limited short-circuit currents in OSC devices.

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Multimodal Nonlinear Optical Imaging for Sensitive Detection of Multiple Pharmaceutical Solid-State Forms and Surface Transformations

Two nonlinear imaging modalities, coherent anti-Stokes Raman scattering (CARS) and sum-frequency generation (SFG), were successfully combined for sensitive multimodal imaging of multiple solid-state forms and their changes on drug tablet surfaces. Two imaging approaches were used and compared: (i) hyperspectral CARS combined with principal component analysis (PCA) and SFG imaging and (ii) simultaneous narrowband CARS and SFG imaging. Three different solid-state forms of indomethacin—the crystalline gamma and alpha forms, as well as the amorphous form—were clearly distinguished using both approaches. Simultaneous narrowband CARS and SFG imaging was faster, but hyperspectral CARS and SFG imaging has the potential to be applied to a wider variety of more complex samples. These methodologies were further used to follow crystallization of indomethacin on tablet surfaces under two storage conditions: 30 degrees C/23% RH and 30 degrees C/75% RH. Imaging with (sub)micron resolution showed that the approach allowed detection of very early stage surface crystallization. The surfaces progressively crystallized to predominantly (but not exclusively) the gamma form at lower humidity and the alpha form at higher humidity. Overall, this study suggests that multimodal nonlinear imaging is a highly sensitive, solid-state (and chemically) specific, rapid, and versatile imaging technique for understanding and hence controlling (surface) solid-state forms and their complex changes in pharmaceuticals.

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Scopus rating (2012): SJR 2.674 SNIP 1.715 CiteScore 5.8
Scopus rating (2011): SJR 2.61 SNIP 1.665 CiteScore 5.86
Scopus rating (2010): SJR 2.375 SNIP 1.607
Azopolymer photopatterning for directional control of angiogenesis

Understanding cellular behavior in response to microenvironmental stimuli is central to tissue engineering. An increasing number of reports emphasize the high sensitivity of cells to the physical characteristics of the surrounding milieu and in particular, topographical cues. In this work, we investigated the influence of dynamic topographic signal presentation on sprout formation and the possibility to obtain a space–time control over sprouting directionality without growth factors, in order to investigate the contribution of just topography in the angiogenic process. To test our hypothesis, we employed a 3D angiogenesis assay based on the use of spheroids derived from human umbilical vein endothelial cells (HUVECs). We then modulated the in situ presentation of topographical cues during early-stage angiogenesis through real-time photopatterning of an azobenzene-containing polymer, poly (Disperse Red 1 methacrylate) (pDR1m). Pattern inscription on the polymer surface was made using the focused laser of a confocal microscope. We demonstrate that during early-stage angiogenesis, sprouts followed the pattern direction, while spheroid cores acquired a polarized shape. These findings confirmed that sprout directionality was influenced by the photo-inscribed pattern, probably through contact guidance of leader cells, thus validating the proposed platform as a valuable tool for understanding complex processes involved in cell-topography interactions in multicellular systems. Statement of Significance The complex relationship between endothelial cells and the surrounding environment that leads to formation of a newly formed vascular network during tissue repair is currently unknown. We have developed an innovative in vitro platform to study these mechanisms in a space and time controlled fashion simulating what happens during regeneration. In particular, we combine a “smart” surface, namely a polymer film, with a three-dimensional living cell aggregate. The polymer is activated by light through which we can design a path to guide cells toward the formation of a new vessel. Our work lies at the intersection of stimuli-responsive biointerfaces and cell biology and may be particularly inspiring for those interested in designing biomaterial surface related to angiogenesis.

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Aerobic wastewater management is energy intensive and thus anaerobic processes are of interest. In this study, a microbial fuel cell was used to produce electricity from xylose which is an important constituent of lignocellulosic waste. Hydraulic retention time (HRT) was optimized for the maximum power density by gradually decreasing the HRT from 3.5 d to 0.17 d. The highest power density (430 mW/m²) was obtained at 1 d HRT. Coulombic efficiency decreased from 30% to 0.6% with HRTs of 3.5 d and 0.17 d, respectively. Microbial community analysis revealed that anode biofilm contained known exoelectrogens, including Geobacter sp. and fermentative organisms were present in both anolyte and the anode biofilm. The peak power densities were obtained at 1-1.7 d HRTs and xylose degraded almost completely even with the lowest HRT of 0.17 d, which demonstrates the efficiency of up-flow MFC for treating synthetic wastewater containing xylose.
Modelling recovery of ammonium from urine by electro-concentration in a 3-chamber cell

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Production of long chain alkyl esters from carbon dioxide and electricity by a two-stage bacterial process
Microbial electrosynthesis (MES) is a promising technology for the reduction of carbon dioxide into value-added multicarbon molecules. In order to broaden the product profile of MES processes, we developed a two-stage process for
microbial conversion of carbon dioxide and electricity into long chain alkyl esters. In the first stage, the carbon dioxide is reduced to organic compounds, mainly acetate, in a MES process by Sporomusa ovata. In the second stage, the liquid end-products of the MES process are converted to the final product by a second microorganism, Acinetobacter baylyi in an aerobic bioprocess. In this proof-of-principle study, we demonstrate for the first time the bacterial production of long alkyl esters (wax esters) from carbon dioxide and electricity as the sole sources of carbon and energy. The process holds potential for the efficient production of carbon-neutral chemicals or biofuels.

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**Nanofibrillar cellulose hydrogels and reconstructed hydrogels as matrices for controlled drug release**

Concentrated 3% and 6.5% anionic nanofibrillar cellulose (ANFC) hydrogels were introduced as matrix reservoirs for controlled delivery applications of small molecules and proteins. A further aim was to study how the freeze-drying and subsequent rehydration of ANFC hydrogel affects the rheological properties and drug release of selected model compounds from the reconstructed hydrogels. It was demonstrated that the 3% and 6.5% ANFC hydrogels can be freeze-dried with suitable excipients into highly porous aerogel structures and redispersed back into the hydrogel form without significant change in the rheological properties. Freeze-drying did not affect the drug release properties from redispersed ANFC hydrogels, indicating that these systems could be stored in the dry form and only redispersed when needed. For large molecules, the diffusion coefficients were significantly smaller when higher ANFC fiber content was used, indicating that the amount of ANFC fibers in the hydrogel can be used to control the release rate. The release of small molecules was controlled with the ANFC fiber content only to a moderate extent. The results indicate that ANFC hydrogel can be used for controlled delivery of several types of molecules and that the hydrogel can be successfully freeze-dried and...
Effect of macro- and micro-nutrients addition during anaerobic mono-digestion of grass silage in leach-bed reactors

The effect of macro- \((\text{NH}_4\text{Cl})\) (set I) and micro-nutrients \((\text{Fe}, \text{Ni}, \text{Co} \text{ and } \text{Mo})\) (set II) addition on chemical oxygen demand (COD) solubilisation during anaerobic mono-digestion of grass silage was investigated in two sets of leach bed reactor experiments at 35°C. Results showed that addition of \text{NH}_4\text{Cl} and micro-nutrients improved COD solubilisation by 18% \((0.56 \text{ g SCOD g}^{-1} \text{ volatile solids})\) and 7% \((0.45 \text{ g SCOD g}^{-1} \text{ VS})\), respectively than control. About 20–50% of the added micro-nutrients were bioavailable in the produced leachates, while the rest (50–80%) were adsorbed onto the grass silage. Results of biological methane potential assays showed that, specific methane yields of grass silage were improved by 17% \((0.36 \pm 0.02 \text{ m}^3 \text{ CH}_4 \text{ kg}^{-1} \text{ VS}_{\text{added}})\) when \text{NH}_4\text{Cl} was supplemented while Fe, Ni, Co and Mo addition improved methane yields by 15% \((0.33 \pm 0.005 \text{ m}^3 \text{ CH}_4 \text{ kg}^{-1} \text{ VS}_{\text{added}})\) when compared to control.
A demand-based nutrient utilization approach to urban biogas plant investment based on regional crop fertilization

This study aimed to develop a regional nutrient demand-based approach to assess the potential use of digestate nutrients from a planned biogas plant investment as a part of a regional circular economy concept. The assumed biogas plant is expected to treat urban wastes; biowastes (23,500 t/y) and sewage sludges (120,000 t/y) from the Tampere region, Finland (total population of 500,000). The calculation of the regional nutrient balance was based on the fertilizable crop areas, fertilization regimes and biomass nutrient amounts, with an assumption that livestock manures were primarily utilized in crop production. Subsequently, a Geographic Information System (GIS)-based methodology was applied to evaluate the transportation distances of nutrients from the biogas plant to the closest crop fields. As a result from the presented approach, livestock manure covered 41% and 12% of the phosphorus (P) and soluble nitrogen (N) need of the studied region. There was a residual potential for the regional utilization of biogas plant nutrients, which together with the livestock manure accounted for 50% of P and 15% of soluble-N need. Transportation of nutrients up to 40 km from the biogas plant is necessary if all nearby fields receive the waste-based nutrients, while the distance increased to 66 km if 30% of the local farmers are willing to use the nutrients. The approach presented in this study acts as a tool for planning nutrient cycles, which can be used to sustainably manage the regional nutrient flows when planning a new biogas plant investment.
Techno-economic analysis of a power to biogas system operated based on fluctuating electricity price

This article presents a feasibility analysis of a novel operating principle based on fluctuating electricity prices for an existing biogas plant. By investing in an electrolyzer, excess electricity from renewable production can be stored as CH4 by biological methanation of H2 with CO2 originating from the biogas plant. The main components of the system are an electrolyzer that is connected to an electric grid and an anaerobic digester where the methanation takes place as well as a biogas upgrading unit. First the energy flow of the system was studied, and secondly the operation costs of the system as well as the electrolyzer investment payback time were evaluated.

The study showed that up to 40% of the electricity fed into the system can be stored as biomethane, and the system energy flow is most sensitive to the electrolyzer efficiency. The economics of the studied system depend mostly on the electrolyzer investment cost and desired target price for the CH4. The system can be run economically with current electricity prices if the electrolyzer investment costs decrease 60–72% or the price of CH4 increases 20–76% depending on the investment interest and price fluctuation scheme.

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Stable blue phase polymeric Langmuir-Schaefer films based on unsymmetrical hydroxyalkadiynyl N-arylcarbamate derivatives

Unsymmetrical diynes containing N-arylcarbamate groups in the hydrophobic part and hydroxymethylene groups in the hydrophilic part of the molecules were synthesized and studied. The Langmuir monolayer formation process was followed by Brewster angle microscopy (BAM). The Langmuir-Schaefer monolayer films, transferred on solid substrates (quartz or Si), were investigated by absorption spectroscopy and atomic force microscopy (AFM). Four substances had 2 methylene groups in the hydrophilic part of the molecule (n) and 4 or 5 of these groups in the hydrophobic part (m). At the same time the aryl substituent had a hydrogen atom or a MeO group in the p-position of the benzene ring. After 20 min of UV irradiation the initially colorless monomeric films of all four compounds turned into stable blue phase polymeric films. The blue phase is unusual for alcoholic diacetylene derivatives. The BAM and AFM measurements demonstrated higher homogeneity of the films with a MeO group in the aryl substituent in comparison to the molecules with a hydrogen atom. The reasons for these different structural organizations as well as potential applications of stable blue phase polydiacetylene thin films are discussed.

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Effect of natural convection and radiation inside of a hollow beam in a standard fire

In the design of steel structures, special attention must be paid on structural fire design in order to ensure a specified safe time period that the structure can withstand the fire without collapse. In the European design rules, the standard practise assumes uniform temperature for steel beam cross sections while the surrounding area is subjected to the so called standard fire. When the ambient temperature field is not uniform (e.g. at beam joint areas) neither will be the beam cross section temperature field. This paper studies the contribution of natural convection and cavity radiation to the temperature field of a hollow beam cross section in the case of non-uniform ambient temperature by using transient CFD-simulations.
New Evidence for the Mechanism of Action of a Type-2 Diabetes Drug Using a Magnetic Bead-Based Automated Biosensing Platform

The mechanism of action (MOA) of the first line type-2 diabetes drug metformin remains unclear despite its widespread usage. However, recent evidence suggests that the mitochondrial copper (Cu)-binding action of metformin may contribute toward the drug's MOA. Here, we present a novel biosensing platform for investigating the MOA of metformin using a magnetic microbead-based agglutination assay which has allowed us to demonstrate for the first time the interaction between Cu and metformin at clinically relevant low micromolar concentrations of the drug, thus suggesting a potential pathway of metformin's blood-glucose lowering action. In this assay, cysteine-functionalized magnetic beads were agglutinated in the presence of Cu due to cysteine's Cu-chelation property. Addition of clinically relevant doses of metformin resulted in disaggregation of Cu-bridged bead-clusters, whereas the effect of adding a closely related but blood-glucose neutral drug propanedimidamide (PDI) showed completely different responses to the clusters. The entire assay was integrated in an automated microfluidics platform with an advanced optical imaging unit by which we investigated these aggregation-disaggregation phenomena in a reliable, automated, and user-friendly fashion with total assay time of 17 min requiring a sample (metformin/PDI) volume of 30 μL. The marked difference of Cu-binding action between the blood-glucose lowering drug metformin and its inactive analogue PDI thus suggests that metformin's distinctive Cu-binding properties may be required for its effect on glucose homeostasis. The novel automated platform demonstrating this novel investigation thus holds the potential to be utilized for investigating significant and sensitive molecular interactions via magnetic bead-based agglutination assay.
Bioelectrochemical Recovery of Energy and Metals from Simulated Mining Waters

Extremely acidic water with high metal concentrations is often produced during mining and processing of sulfidic ores. Sulfur-oxidizing microorganisms contribute significantly to the acidification of the water streams and oxygen depletion by oxidizing reduced inorganic sulfur compounds (RISCs) — which are released to the mining waters during the processing of sulfide minerals — to sulfuric acid. The acidic water continues leaching metals from minerals and the metal concentrations thus further increase.

Certain metals can be recovered from acidic solutions by using them as the electron acceptor at the cathode of an electrochemical system. The metal ions accept electrons from an electrode and deposit on the surface of the electrode in pure elemental form. The electrical current required for the electrodeposition of metals is conventionally drawn from the oxidation of water. However, with the assist of electroactive microorganisms, biodegradable compounds can be used as the source of the required energy. Electroactive microorganisms oxidize a substrate and donate electrons to an anode electrode. The flow of electrons from anode to cathode creates electrical current, which can be utilized in the electrodeposition of the metals. As mining waters do not usually contain organic compounds, RISCs are promising substrates for the recovery of metals from mining waters — they are present in the same stream and can be oxidized at lower potential than water. In addition, with the electrochemical treatment both metals and RISCs could be removed from the water streams simultaneously.

The aim of this work was to use tetrathionate (S4O62-) as the substrate for bioelectrochemical and electrochemical current generation. The possibility to spontaneously produce electricity from tetrathionate was first studied in microbial fuel cells (Paper I). After successful electricity production was obtained, a tetrathionate-fed microbial fuel cell was monitored for over 740 days to determine the long-term stability of such systems (Paper II). The anode potential was then externally adjusted in order to determine the minimum anode potential required for bioelectrochemical and electrochemical tetrathionate degradation (Paper III). Finally, the external voltage required for the simultaneous removal of tetrathionate and copper was determined (Paper IV).

The experiments were conducted using two-chamber flow through reactors at room temperature (22±5 °C) and highly acidic conditions (pH < 2.5). The initial lag-time for electricity production from tetrathionate was relatively long in bioelectrochemical systems (approximately 100 days), but spontaneous electricity production was proven successful with ferric iron as the cathodic electron acceptor. By optimizing the external resistance, the current density was successfully improved from 80 mA m-2 (1000 Ω) to 225 mA m-2 (100 Ω). In the long-term experiment, biofouling or accumulating reaction products were not observed to limit the electricity production even after 740 days of operation. The minimum anode potential for tetrathionate degradation was observed to be 0.3 V vs. Ag/AgCl in the bioelectrochemical systems and 0.5 V in the abiotic electrochemical systems. Higher tetrathionate degradation rates were obtained in the bioelectrochemical systems (>110 mg L-1 d-1) than in the electrochemical systems (<35 mg L-1 d-1). The reaction products of bioelectrochemical tetrathionate degradation were sulfate and elemental sulfur, while in electrochemical systems only sulfate was detected. For the efficient removal of tetrathionate and copper, applied voltage of above 1.0 V was required. The concentrations of tetrathionate and copper were successfully decreased below the limits set for toxicity (0.5 g S4O62- L-1) and mining effluent discharge (0.3 mg Cu2+ L-1).

This study demonstrates for the first time that tetrathionate can be used the substrate for bioelectrochemical current generation. In bioelectrochemical systems with an efficient catholyte, tetrathionate is degraded and electricity is produced spontaneously, but abiotic electrochemical degradation requires external energy. Both bioelectrochemical and electrochemical systems provided higher current densities than a water-oxidizing control reactor when controlling the anode potential or applying external voltage. The simultaneous removal of tetrathionate and copper shows that bioelectrochemical and electrochemical systems are promising alternatives for the treatment of mining waters.
Hole-Transporting Materials for Printable Perovskite Solar Cells

Perovskite solar cells (PSCs) represent undoubtedly the most significant breakthrough in photovoltaic technology since the 1970s, with an increase in their power conversion efficiency from less than 5% to over 22% in just a few years. Hole-transporting materials (HTMs) are an essential building block of PSC architectures. Currently, 2,2',7,7'-tetrakis-(N,N'-di-p-methoxyphenylamine)-9,9'-spirobifluorene), better known as spiro-OMeTAD, is the most widely-used HTM to obtain high-efficiency devices. However, it is a tremendously expensive material with mediocre hole carrier mobility. To ensure wide-scale application of PSC-based technologies, alternative HTMs are being proposed. Solution-processable HTMs are crucial to develop inexpensive, high-throughput and printable large-area PSCs. In this review, we present the most recent advances in the design and development of different types of HTMs, with a particular focus on mesoscopic PSCs. Finally, we outline possible future research directions for further optimization of the HTMs to achieve low-cost, stable and large-area PSCs.
Conjugated Heat Transfer Simulation of a Fin-and-Tube Heat Exchanger

Heat transfer and pressure drop of a fin-and-tube heat exchanger are studied by taking into account the conjugated heat transfer between the flow and the fin. The temperature distribution of the fin is calculated in respect to the convective heat transfer of the air flowing through the tube bank channel. Contemporary enhancement methods emphasize the importance of local turbulence augmentation which affects the convective heat transfer. In this paper, the importance of conjugated heat transfer, where the temperature of the flow and fin are coupled together is emphasized and compared with a constant surface temperature boundary condition simulation and experiment, which are found in the literature.

Understanding selenium biogeochemistry in engineered ecosystems: Transformation and analytical methods

Selenium is used extensively in many industries, and it is necessary for human nutrition. On the other hand, it is also toxic at slightly elevated concentrations. With the advent of industrialisation, selenium concentrations in the environment due to anthropogenic activities have increased. Treatment of selenium-laden wastewaters and bioremediation are of increasing importance for countering contamination. Developing an effective treatment process requires the identification of all the selenium chemical species and their concentrations in engineered settings. This chapter collates the available techniques for identifying and quantifying various selenium species in gas, liquid, and solid phases, including X-ray absorption spectroscopy, electron microscopy, and liquid/gas chromatography. This chapter also throws light on isotopic fractionation
and sequential extraction methods used to study the behaviour of selenium. Prior to the discussion of analytical methods, this chapter discusses selenium mineralogy and biochemistry. Finally, the chapter concludes by discussing potential future analytical techniques that will further improve our understanding of selenium biogeochemistry in engineered bioprocesses.

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**Comparison of liposomal drug formulations for transdermal iontophoretic drug delivery**
This study was aimed to evaluate the in vitro transdermal direct/pulsed current iontophoretic delivery of an amphiphilic model compound from various lipid vesicle-encapsulated formulations compared to free-drug formulation. Conventional, pegylated, ultra deformable liposomes (transfersomes) and ethosomes loaded with a negatively charged drug diclofenac sodium (DS) were prepared and characterized. All the liposomes possessed an average size of ≈ 100–150 nm and negative zeta potential. No changes in colloidal stability were detected after 8 h incubation of any vesicle formulation under constant or pulsed iontophoretic current. DS was released from all the liposome formulations with a similar, limited rate (≈ 50% in 24 h), leading therefore to significantly lower transdermal fluxes across full-thickness porcine skin compared to the respective free drug formulation. From the tested lipid vesicle formulations, the transfersomes resulted in the highest passive flux and the ethosomes in the highest iontophoretic flux under direct constant current treatment. Higher negative surface charge of the vesicle led to better transport efficiency due to the higher mobility of the drug carrier under electric field. Pulsed current iontophoresis had no advantage over constant current treatment in combination with any type of lipid vesicular nanocarriers, in contrast to what has been described earlier with drug-loaded polymeric nanocarriers.

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A new method to optimize natural convection heat sinks

The performance of a heat sink cooled by natural convection is strongly affected by its geometry, because buoyancy creates flow. Our model utilizes analytical results of forced flow and convection, and only conduction in a solid, i.e., the base plate and fins, is solved numerically. Sufficient accuracy for calculating maximum temperatures in practical applications is proved by comparing the results of our model with some simple analytical and computational fluid dynamics (CFD) solutions. An essential advantage of our model is that it cuts down on calculation CPU time by many orders of magnitude compared with CFD. The shorter calculation time makes our model well suited for multi-objective optimization, which is the best choice for improving heat sink geometry, because many geometrical parameters with opposite effects influence the thermal behavior. In multi-objective optimization, optimal locations of components and optimal dimensions of the fin array can be found by simultaneously minimizing the heat sink maximum temperature, size, and mass. This paper presents the principles of the particle swarm optimization (PSO) algorithm and applies it as a basis for optimizing existing heat sinks.

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**Locomotion of light-driven soft microrobots through a hydrogel via local melting**

Soft mobile microrobots whose deformation can be directly controlled by an external field can adapt to move in different environments. This is the case for the light-driven microrobots based on liquid-crystal elastomers (LCEs). Here we show that the soft microrobots can move through an agarose hydrogel by means of light-controlled travelling-wave motions. This is achieved by exploiting the inherent rise of the LCE temperature above the melting temperature of the agarose gel, which facilitates penetration of the microrobot through the hydrogel. The locomotion performance is investigated as a function of the travelling-wave parameters, showing that effective propulsion can be obtained by adapting the generated motion to the specific environmental conditions.

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Authors: Palagi, S., Mark, A. G., Melde, K., Qiu, T., Zeng, H., Parmeggiani, C., Martella, D., Wiersma, D. S., Fischer, P.
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**Effects of different nickel species on autotrophic denitrification driven by thiosulfate in batch tests and a fluidized-bed reactor**

Nickel is a common heavy metal and often occurs with nitrate (NO₃⁻) in effluents from mining and metal-finishing industry. The present study investigates the effects of increasing concentrations (5–200 mg Ni/L) of NiEDTA²⁻ and NiCl₂ on autotrophic denitrification with thiosulfate (S₂O₃²⁻) in batch tests and a fluidized-bed reactor (FBR). In batch bioassays, 50 and 100 mg Ni/L of NiEDTA²⁻ only increased the transient accumulation of NO₂⁻, whereas 25–100 mg Ni/L of NiCl₂ inhibited denitrification by 9–19%. NO₃⁻ and NO₂⁻ were completely removed in the FBR at feed NiEDTA²⁻ and NiCl₂ concentrations as high as 100 and 200 mg Ni/L, respectively. PCR-DGGE revealed the dominance of Thiobacillus denitrificans and the presence of the sulfate-reducing bacterium Desulfovibrio putealis in the FBR microbial community at all feed nickel concentrations investigated. Nickel mass balance, thermodynamic modeling and solid phase characterization indicated that nickel sulfide, phosphate and oxide precipitated in the FBR during NiCl₂ injection.
Nanofibrillar cellulose-alginate hydrogel coated surgical sutures as cell-carrier systems

Hydrogel nanomaterials, especially those that are of non-human and non-animal origins, have great potential in biomedical and pharmaceutical sciences due to their versatility and inherent soft-tissue like properties. With the ability to simulate native tissue function, hydrogels are potentially well suited for cellular therapy applications. In this study, we have fabricated nanofibrillar cellulose-alginate (NFCA) suture coatings as biomedical devices to help overcome some of the limitations related to cellular therapy, such as low cell survivability and distribution out of target tissue. The addition of sodium alginate 8% (w/v) increased the NFCA hydrogel viscosity, storage and loss moduli by slightly under one order of magnitude, thus contributing significantly to coating strength. Confocal microscopy showed nearly 100% cell viability throughout the 2-week incubation period within and on the surface of the coating. Additionally, typical morphologies in the dual cell culture of spheroid forming HepG2 and monolayer type SK-HEP-1 were observed. Twelve out of 14 NFCA coated surgical sutures remained intact during the suturing operation with various mice and rat tissue; however, partial peeling off was observed in 2 of the coated sutures. We conclude that NFCA suture coatings could perform as cell-carrier systems for cellular based therapy and post-surgical treatment.
Photoresponsive Polymer Hydrogel Coatings that Change Topography

This chapter provides a brief overview of the principles as well as the potential applications of photoresponsive hydrogel films, which change surface topography. It discusses the operating mechanisms that lead to topographical changes. Changes in topography can affect the wettability of a surface, which is an interesting characteristic for making self-cleaning coatings. The chapter also discusses polymer films that are useful for the development of self-cleaning films. It then discusses responsive materials, for cell culturing and microfluidics applications. The chapter further shows that appealing photoresponsive polymer hydrogel coatings that change topography can be fabricated, which holds great promise in a variety of fields ranging from microfluidic devices to biomedical applications. When the structures of the topography are in the micrometer size regime, they influence the wettability of the surface. Two types of wetting can be defined: Wenzel and Cassie-Baxter.

Responsive Polymer Surfaces: Dynamics in Surface Topography

This chapter provides a brief overview of the principles as well as the potential applications of photoresponsive hydrogel films, which change surface topography. It discusses the operating mechanisms that lead to topographical changes. Changes in topography can affect the wettability of a surface, which is an interesting characteristic for making self-cleaning coatings. The chapter also discusses polymer films that are useful for the development of self-cleaning films. It then discusses responsive materials, for cell culturing and microfluidics applications. The chapter further shows that appealing photoresponsive polymer hydrogel coatings that change topography can be fabricated, which holds great promise in a variety of fields ranging from microfluidic devices to biomedical applications. When the structures of the topography are in the micrometer size regime, they influence the wettability of the surface. Two types of wetting can be defined: Wenzel and Cassie-Baxter.
Effect of alkylaminophenols on growth inhibition and apoptosis of bone cancer cells

In this work, we report the anticancer properties of a series of 11 chemically synthesized alkylaminophenols against human osteosarcoma U2OS tumor cell line. Several assays including cytotoxicity, inhibitor kinetic study, cell migration, Annexin-V/PI double staining, reactive oxygen species (ROS) and caspase 3/7 assays were conducted on this cell line. Cytotoxic 2-((3,4-dihydroquinolin-1(2H)-yl)(p-tolyl)methyl)phenol was determined to have an IC50 value of 36.6μM against U2OS cells and it also inhibits the cell growth in time-dependent manner. The potent activity of lead compound against the growth of multiple cell lines, U2OS, MG-63 and HEK-293T, confirms the osteosarcoma cell specific inhibition. Further studies indicated that such compound is an inhibitor of metastatic property of tumor cells and inducing apoptosis agent. The ability of increasing ROS and inducing caspases 3 and 7 further confirm the contribution of programmed cell death in U2OS and HEK-293T cells. Additionally, four compounds based on the 2-(indolin-1-yl(aryl)methyl)-4-nitrophenol core were also identified to be cytotoxic with IC50 values in the 66-88μM range. This work further demonstrates the anticancer properties of phenol derivatives, adding one more entry to the collection of promising chemotherapeutic agents for cancer treatment.

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Authors: Doan, P., Nguyen, T., Yli-Harja, O., Candeias, N. R., Kandhavelu, M.
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Bibliographical note
Long-Range Observation of Exciplex Formation and Decay Mediated by One-Dimensional Bridges

We report herein unprecedented long-range observation of both formation and decay of the exciplex state in donor (D)-bridge (B)-acceptor (A) linked systems. Zinc porphyrins (ZnP) as a donor were tethered to single-walled carbon nanotube (SWNT) as an acceptor through oligo(p-phenylene)s (ZnP-phn-SWNT) or oligo(p-xylene)s (ZnP-xyn-1-phn-SWNT) with systematically varied lengths (n = 1-5) to address the issue. Exponential dependencies of rate constants for the exciplex formation (k_{FEX}) and decay (k_{DEX}) on the edge-to-edge separation distance between ZnP and SWNT through the bridges were unambiguously derived from time-resolved spectroscopies. Distance dependencies (i.e., attenuation factor, \(\beta\)) of k_{FEX} and k_{DEX} in ZnP-phn-SWNT were found to be considerably small (\(\beta = 0.10\) for k_{FEX} and 0.12 Å\(^{-1}\) for k_{DEX}) compared to those for charge separation and recombination (0.2-0.8 Å\(^{-1}\)) in D-B-A systems with the same oligo(p-phenylene) bridges. The small \(\beta\) values may be associated with the exciplex state with mixed characters of charge-transfer and excited states. In parallel, the substantially nonconjugated bridge of oligo(p-xylene)s exhibited larger attenuation values (\(\beta = 0.12\) for k_{FEX} and 0.14 Å\(^{-1}\) for k_{DEX}). These results provide deep insight into the unique photodynamics of electronically strongly coupled D-B-A systems involving exciplex.

Effects of alternative electron acceptors on the activity and community structure of methane-producing and consuming microbes in the sediments of two shallow boreal lakes

The role of anaerobic CH4 oxidation in controlling lake sediment CH4 emissions remains unclear. Therefore, we tested how relevant EAs (SO4\(^{2-}\), NO3\(^{-}\), Fe3+, Mn4+, O2) affect CH4 production and oxidation in the sediments of two shallow boreal lakes. The changes induced to microbial communities by the addition of Fe3+ and Mn4+ were studied using next-generation sequencing targeting the 16S rRNA and methyl-coenzyme M reductase (mcrA) genes and mcrA transcripts. Putative anaerobic CH4 oxidizing archaea (ANME-2D) and bacteria (NC 10) were scarce (up to 3.4% and 0.5% of archaeal and bacterial 16S rRNA genes, respectively), likely due to the low environmental stability associated with shallow depths. Consequently, the potential anaerobic CH4 oxidation (0-2.1 nmol g-1 dry weight (DW)d-1) was not enhanced by
the addition of EAs, nor important in consuming the produced CH4 (0.6-82.5 nmol g-1DWd-1). Instead, the increased EA availability suppressed CH4 production via the outcompetition of methanogens by anaerobically respiring bacteria and via the increased protection of organic matter from microbial degradation induced by Fe3+ and Mn4+. Future studies could particularly assess whether anaerobic CH4 oxidation has any ecological relevance in reducing CH4 emissions from the numerous CH4-emitting shallow lakes in boreal and tundra landscapes.

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The role of inorganics in modelling of biomass gasification
In this work, a summary of the research carried out about the role of inorganic elements in biomass gasification is presented. The research work has focused on the catalytic effects of alkali and alkaline earth metals in char gasification. The work has included gasification experiments using thermogravimetric analysis (TGA) and fluidized beds as well as modeling techniques. The results of the research presented in this paper indicate that the laboratory measured TGA reactivity numbers and correlations (including the effect of fuel ash inorganics) are possible to be converted to numbers predicting carbon conversion in a large scale fluidized bed gasification reactor. The model, called Carbon Conversion Predictor, is a relatively simple and transparent tool for the comparison of the gasification reactivity of different fuels in fluidized bed gasification.

General information
State: Published
Self-Regulating Iris Based on Light-Actuated Liquid Crystal Elastomer

The iris, found in many animal species, is a biological tissue that can change the aperture (pupil) size to regulate light transmission into the eye in response to varying illumination conditions. The self-regulation of the eye lies behind its autofocusing ability and large dynamic range, rendering it the ultimate “imaging device” and a continuous source of inspiration in science. In optical imaging devices, adjustable apertures play a vital role as they control the light exposure, the depth of field, and optical aberrations of the systems. Tunable irises demonstrated to date require external control through mechanical actuation, and are not capable of autonomous action in response to changing light intensity without control circuitry. A self-regulating artificial iris would offer new opportunities for device automation and stabilization. Here, this paper reports the first iris-like, liquid crystal elastomer device that can perform automatic shape-adjustment by reacting to the incident light power density. Similar to natural iris, the device closes under increasing light intensity, and upon reaching the minimum pupil size, reduces the light transmission by a factor of seven. The light-responsive materials design, together with photoalignment-based control over the molecular orientation, provides a new approach to automatic, self-regulating optical systems based on soft smart materials.
CFD based reactivity parameter determination for biomass particles of multiple size ranges in high heating rate devolatilization

This work presents a methodology that combines experimental measurements and Computational Fluid Dynamics (CFD) modeling to determine the global reaction kinetics of high heating rate biomass devolatilization. Three particle size ranges of woody biomass are analyzed: small (SF), medium (MF) and large (LF) fractions. Devolatilization mass loss is measured for each fraction in a laminar Drop-Tube Reactor (DTR) in nitrogen atmosphere, using two nominal reactor temperatures of 873 and 1173 K. Single First Order Reaction (SFOR) kinetics are determined by coupling an optimization routine with CFD models of the DTR. The global pre-exponential factors and activation energies for the SF, MF and LF particles are 5880 1/s and 42.7 kJ/mol, 48.1 1/s and 20.2 kJ/mol, and 102 1/s and 24.8 kJ/mol, respectively. These parameters are optimized for the isothermal heat transfer model available in CFD programs, and it is recommended that the specific heat capacity that was used in the optimization (1500 J/kgK) is used together with the parameters. Using the SF kinetics for small wood particles and either of the MF or LF kinetics for large particles, it is expected that more accurate devolatilization predictions can be obtained for the whole fuel size distribution in large scale CFD simulations.

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Scopus rating (2010): SJR 1.814 SNIP 2.725
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Scopus rating (2008): SJR 1.106 SNIP 1.444
Scopus rating (2007): SJR 0.913 SNIP 1.481
Scopus rating (2006): SJR 0.875 SNIP 1.306
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Impact of film thickness of ultra-thin dip-coated compact TiO2 layers on the performance of mesoscopic perovskite solar cells

Uniform and pinhole-free electron selective TiO2 layers are of utmost importance for efficient perovskite solar cells. Here we used a scalable and low-cost dip coating method to prepare uniform and ultra-thin (5−50 nm) compact TiO2 films on fluorine doped tin oxide (FTO) glass substrates. The thickness of the film was tuned by changing the TiCl4 precursor concentration. The formed TiO2 follows the texture of the underlying FTO substrates, but at higher TiCl4 concentrations, the surface roughness is substantially decreased. This change occurs at a film thickness close to 20−30 nm. A similar TiCl4 concentration is needed to produce crystalline TiO2 films. Furthermore, below this film thickness, the underlying FTO might be exposed resulting in pinholes in the compact TiO2 layer. When integrated into mesoscopic perovskite solar cells, there appears to be a similar critical compact TiO2 layer thickness above which the devices perform more optimally. The power conversion efficiency was improved by more than 50% (from 5.5% to ~8.6%) when inserting a compact TiO2 layer. Devices without or with very thin compact TiO2 layers display J-V curves with an “s-shaped” feature in the negative voltage range, which could be attributed to immobile negative ions at the electron-extracting interface. A strong correlation between the magnitude of the s-shape feature and the exposed FTO seen in the x-ray photoelectron spectroscopy measurements indicates that the s-shape is related to pinholes in the compact TiO2 layer when it is too thin.

Molding Optical Waveguides with Nematicons

Optical waveguides are usually fabricated by top-down methods. Hereby, this study demonstrates a bottom-up approach based on nonlinear optics in reorientational nematic liquid crystals with polymerizable materials. Near-infrared optical spatial solitons—nematicons—in conjunction with UV exposure are employed in order to achieve (i) real-time signal waveguiding for point-to-point beam-induced interconnects by effectively quenching the fluctuations of nematicon
trajectories through polymer stabilization; (ii) the molding of permanent channel waveguides in a crosslinked polymer network, so that they persist after turning off the soliton beam and confine signals of various wavelengths and intensities. These findings introduce a novel, highly versatile platform and a wealth of possibilities for guided-wave photonics, signal addressing, and processing in liquid crystalline soft matter.

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Authors: Karimi, N., Virkki, M., Alberucci, A., Buchnev, O., Kauranen, M., Priimägi, A., Assanto, G.
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Charge Carrier Dynamics in Solar Water Oxidation
The search for sustainable energy sources is one of the greatest problems facing mankind in the 21st century. Most renewable sources do not have adequate potential to cover the growing need for energy in order to sustain economic and population growth. Solar power is a plausible way to fully cover mankind’s continuously growing need for energy. However, sunlight is diurnal, and the amount of sunlight received at different latitudes of the Earth varies drastically. Harnessing solar energy into chemical bonds is an attractive approach to enable the storage of energy for transportation and later use. Direct photoelectrochemical water splitting produces only oxygen and hydrogen, of which hydrogen can be used to sustain a possible hydrogen based economy. The materials used in this Thesis are metal oxide semiconductors that act as photoanodes, performing the water oxidation reaction on their surface and supplying electrons for the water reduction reaction.

Hematite is an n-type metal oxide semiconductor that has a band gap suitable for the absorption of a noticeable fraction of solar radiation. The absorption of light leads to the generation of electron-hole pairs that are separated due to a built-in electric field. However, the conduction band level of hematite is not suitable for unassisted water splitting and it suffers from poor intrinsic charge transport properties. For this reason the photoanodes studied in this Thesis have been modified with doping and by forming heterojunctions with other metal oxide semiconductors, namely titanium dioxide.

This Thesis studies the evolution of the primary charge carriers responsible for water splitting in modified hematite photoanodes. The method selected to probe the charge carrier dynamics is transient absorption spectroscopy that enables the monitoring of charge carriers from the subpicosecond timescale up to seconds. The measurements were performed in a three electrode photoelectrochemical cell to see the effects of additional bias voltage on the charge carrier dynamics and how the recombination and oxygen evolution reaction are changed when a photocurrent is generated.

The results of this Thesis indicate that the modification of hematite has a profound effect on the charge carrier behaviour. The observed effects range from changes in recombination on the picosecond timescale, to nanosecond timescale trapping of electrons into intraband or surface states, and all the way to changes in the reaction rates of long-lived holes in the hundreds of milliseconds timescale.

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Authors: Ruoko, T.
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Publication information
Biohydrogen production from xylose by fresh and digested activated sludge at 37, 55 and 70 °C

Two heat–treated inocula, fresh and digested activated sludge from the same municipal wastewater treatment plant, were compared for their H₂ production via dark fermentation at mesophilic (37 °C), thermophilic (55 °C) and hyperthermophilic (70 °C) conditions using xylose as the substrate. At both 37 and 55 °C, the fresh activated sludge yielded more H₂ than the digested sludge, whereas at 70 °C, neither of the inocula produced H₂ effectively. A maximum yield of 1.85 mol H₂ per mol of xylose consumed was obtained at 55 °C. H₂ production was linked to acetate and butyrate production, and there was a linear correlation (R² = 0.96) between the butyrate and H₂ yield for the fresh activated sludge inoculum at 55 °C. Approximately 2.4 mol H₂ per mol of butyrate produced were obtained against a theoretical maximum of 2.0, suggesting that H₂ was produced via the acetate pathway prior to switching to the butyrate pathway due to the increased H₂ partial pressure.Clostridia sp. were the prevalent species at both 37 and 55 °C, irrespectively of the inoculum type. Although the two inocula originated from the same plant, different thermophilic microorganisms were detected at 55 °C. Thermoanaerobacter sp., detected only in the fresh activated sludge cultures, may have contributed to the high H₂ yield obtained with such an inoculum.
Birch wood was leached of its naturally occurring ash forming elements and doped with three concentrations of calcium or potassium before being gasified in a laboratory bubbling fluidized bed reactor. The wood samples were pelletized and inserted into a fluidized bed reactor where they were first pyrolyzed with N₂ and then gasified with CO₂. In addition to tracking the gas concentration of the exit gas, char samples were taken from the fluidized bed and analyzed to study the char properties. The presence of potassium in the biomass was found to have a significant influence on the structure of the resulting char, however potassium did not have an observable catalytic effect on the overall gasification reaction rate with CO₂ due to the formation of a unreactive coke layer on the char surface. In contrast, calcium did increase the char conversion rate and is likely the primary active catalyst in gasification of birch wood with CO₂.
Photoinduced Electron Injection from Zinc Phthalocyanines into Zinc Oxide Nanorods: Aggregation Effects

Phthalocyanines (Pc) are well-known light-harvesting compounds. However, despite the tremendous efforts on phthalocyanine synthesis, the achieved energy conversion efficiencies for Pc-based dye-sensitized solar cells are moderate. To cast light on the factors reducing the conversion efficiency, we have undertaken a time-resolved spectroscopy study of the primary photoinduced reactions at a semiconductor-Pc interface. ZnO nanorods were chosen as a model semiconductor substrate with enhanced specific surface area. The use of a nanostructured oxide surface allows to extend the semiconductor-dye interface with a hole transporting layer (spiro-MeOTAD) in a controlled way, making the studied system closer to a solid-state dye-sensitized solar cell. Four zinc phthalocyanines are compared in this study. The compounds are equipped with bulky peripheral groups designed to reduce the self-aggregation of the Pcs. Almost no signs of aggregation can be observed from the absorption spectra of the Pcs assembled on a ZnO surface. Nevertheless, the time-resolved spectroscopy indicates that there are inter-Pc charge separation-recombination processes in the time frame of 1-100 ps. This may reduce the electron injection efficiency into the ZnO by more than 50%, pointing out to a remaining aggregation effect. Surprisingly, the electron injection time does not correlate with the length of the linker connecting the Pc to ZnO. A correlation between the electron injection time and the "bulkiness" of the peripheral groups was observed. This correlation is further discussed with the use of computational modeling of the Pc arrangements on the ZnO surface. (Figure Presented).

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Organisations: Chemistry and Bioengineering, Research group: Chemistry & Advanced Materials, Instituto Madrileño de Estudios Avanzados (IMDEA)-NanoCien, Universidad Autónoma de Madrid, Mersin University, South-Ukrainian National Pedagogical University
Authors: Virkki, K., Hakola, H., Urbani, M., Tejerina, L., Ince, M., Martínez-Díaz, M. V., Torres, T., Golovanova, V., Golovanov, V., Tkachenko, N. V.
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Scopus rating (2011): SJR 2.32 SNIP 1.457 CiteScore 4.92
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Alkyl thiophene vinylene electropolymerization in C8mimPF6, potential use in solar cells

We report the electrosynthesis of a novel semiconductor polymer based on alkyl vinylthiophene derivative in the presence of an ionic liquid (IL). The polymerization was performed under galvanostatic conditions and the polymer was studied as potential donor component of a multilayer heterojunction organic solar cell (OSC). The monomer used was (E)-1,2-di-(3-octyl-2-thienyl) vinylene (OTV) and the IL used for the electropolymerization was 1-octyl-3-methylimidazolium hexafluorophosphate C8mimPF6. Optical properties, stability and morphology of the polymer were analyzed using FT-IR, UV-vis, Raman and XPS spectroscopy. Voltammetry analysis and scanning electron microscopy (SEM-EDX) were also performed on the polymer. The OSC assembled with the polymer of OTV was used as electro donor and C60 as acceptor. Molybdenum trioxide (MoO3) and bathocuproine (BCP) were used as buffer layer between anode and cathode respectively. I-V curves, in the dark and under AM 1.5 solar simulator were performed to measure its efficiency.

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Synthesis, Structural Characterization, Hirshfeld Surface and Antioxidant Activity Analysis of a Novel Organic Cation Antimonate Complex

A new organic–inorganic hybrid material of formula (C10H15N2)7 Sb2Cl10 Sb2Cl9 (SbCl5)2 SbCl4 2Cl·7H2O was synthesized and characterized by an X-ray diffraction analysis. It crystallizes in the triclinic system with the P space group and the following unit cell parameters a = 11.8127(3) Å, b = 15.7557(4) Å, c = 35.4511(8) Å, α = 89.409(1)°, β = 84.04(1)°, γ = 71.116(1)°, Z = 2 and V = 6207.3(3) Å³. The examination of the structure shows that the two dimensional frameworks are produced by O–H Cl, N–H⋯Cl and N–H⋯O hydrogen bonding. In addition, the most important features of crystal packing and intermolecular interactions in the title complex were quantified via Hirshfeld surface analysis. Differential scanning calorimetry has revealed a dehydration phenomenon at around 348 K. The investigation of the antioxidant activity of the title compound was carried out using the 2,2-diphenyl-1-picrylhydrazyl and ferrous iron chelating methods.

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Crystallisation-enhanced bulk hole mobility in phenothiazine-based organic semiconductors

A series of three novel donor-acceptor systems based on C(3)-malononitrile-substituted phenothiazines was synthesised in good overall yields and their thermal, spectroscopic, and electrochemical properties were characterised. The compounds were prepared through a sequence of Ullmann-coupling, Vilsmeier-Haack formylation and Knoevenagel-condensation, followed by Suzuki-coupling reactions for introduction of aryl substituents at C(7) position of the phenothiazine. The introduction of a donor unit at the C(7) position exhibited a weak impact on the optical and electrochemical characteristics of the compounds and led to amorphous films with bulk hole mobilities in the typical range reported for phenothiazines, despite the higher charge delocalisation as attested by computational studies. In contrast, highly ordered films were formed when using the C(7)-unsubstituted 3-malononitrile phenothiazine, exhibiting an outstanding mobility of 1 × 10−3 cm2 V−1 s−1, the highest reported for this class of compounds. Computational conformational analysis of the new phenothizanes suggested that free rotation of the substituents at the C(7) position suppresses the ordering of the system, thereby hampering suitable packing of the new materials needed for high charge carrier mobility.

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Scopus rating (2013): SJR 1.886 SNIP 1.51 CiteScore 4.06
Building up colors: multilayered arrays of peryleneimides on flat surfaces and on mesoporous layers

Novel monoisomeric perylene imide derivatives with terpyridinyl and pyrrolidinyl substituents were synthesized and deposited onto solid substrates, such as a thin film of Al2O3 and mesoporous TiO2 nanoparticle layer, by using a simple dip-by-dip method. Arrays of up to 33 layers were built on Al2O3. In the case of mesoporous TiO2, the interstitial volume between the particles was filled up with dye assemblies. Deposition could produce either layers of microcrystals or molecular layers if an appropriate washing procedure was used. The resultant arrays were studied by means of scanning electron microscopy, X-ray photoelectron spectroscopy measurements, and UV/Vis absorption.

Fate of metallic engineered nanomaterials in constructed wetlands: prospection and future research perspectives

Metallic engineered nanomaterials (ENMs) undergo various transformations in the environment which affect their fate, toxicity and bioavailability. Although constructed wetlands (CWs) are applied as treatment systems for waste streams potentially containing metallic ENMs, little is known about the fate and effects of ENMs in CWs. Hence, literature data from related fields such as activated sludge wastewater treatment and natural wetlands is used to predict the fate and effects of
ENMs in CWs and to analyze the risk of nanomaterials being released from CWs into surface waters. The ENMs are likely to reach the CW (partly) transformed and the transformations will continue in the CW. The main transformation processes depend on the type of ENM and the ambient environmental conditions in the CW. In general, ENMs are expected to undergo sorption onto (suspended) organic matter and plant roots. Although the risk of ENMs being released at high concentrations from CWs is estimated low, caution is warranted because of the estimated rise in the production of these materials. As discharge of (transformed) ENMs from CWs during normal operation is predicted to be low, future research should rather focus on the effects of system malfunctions (e.g. short-circuiting). Efficient retention in the CW and increasing production volumes in the future entail increasing concentrations within the CW substrate and further research needs to address possible adverse effects caused.

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Organisations: Chemistry and Bioengineering, Laboratory of Industrial Water and Ecotechnology, Universiteit Gent, Laboratory of Analytical Chemistry and Applied Ecochemistry, Laboratory of Chemistry and Bioengineering, Royal Military College of Canada
Authors: Auvinen, H., Gagnon, V., Rousseau, D. P. L., du Laing, G.
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Scopus rating (2016): CiteScore 5.53 SJR 1.568 SNIP 2.438
Scopus rating (2015): SJR 1.233 SNIP 1.846 CiteScore 3.96
Scopus rating (2014): SJR 1.245 SNIP 1.806 CiteScore 3.42
Scopus rating (2013): SJR 0.889 SNIP 1.59 CiteScore 2.42
Scopus rating (2012): SJR 0.941 SNIP 1.192 CiteScore 2.07
Scopus rating (2011): SJR 1.167 SNIP 1.753 CiteScore 2.36
Scopus rating (2010): SJR 1.16 SNIP 1.449
Scopus rating (2009): SJR 0.955 SNIP 1.796
Scopus rating (2008): SJR 0.858 SNIP 1.295
Scopus rating (2007): SJR 0.685 SNIP 0.71
Scopus rating (2006): SJR 0.588 SNIP 0.7
Scopus rating (2005): SJR 0.558 SNIP 0.754
Scopus rating (2004): SJR 0.423 SNIP 0.696
Scopus rating (2003): SJR 0.317 SNIP 0.353
Original language: English
Keywords: Discharge, Effluent, Nanoparticle, Transformation, TSS, Wastewater
ASJC Scopus subject areas: Environmental Engineering, Applied Microbiology and Biotechnology, Waste Management and Disposal, Pollution
DOI:
10.1007/s11157-017-9427-0
Source: Scopus
Source-ID: 85021244022
Research output: Scientific - peer-review › Article

Halogen bonding stabilizes a cis-azobenzene derivative in the solid state: A crystallographic study
Crystals of trans- and cis-isomers of a fluorinated azobenzene derivative have been prepared and characterized by single-crystal X-ray diffraction. The presence of F atoms on the aromatic core of the azobenzene increases the lifetime of the metastable cis-isomer, allowing single crystals of the cis-azobenzene to be grown. Structural analysis on the cis-azobenzene, complemented with density functional theory calculations, highlights the active role of the halogen-bond contact (N...I synthon) in promoting the stabilization of the cis-isomer. The presence of a long aliphatic chain on the azobenzene unit induces a phase segregation that stabilizes the molecular arrangement for both the trans- and cis-isomers. Due to the rarity of cis-azobenzene crystal structures in the literature, our paper makes a step towards understanding the role of non-covalent interactions in driving the packing of metastable azobenzene isomers. This is expected to be important in the future rational design of solid-state, photoresponsive materials based on halogen bonding. We show by single-crystal X-ray diffraction studies and computational analysis that halogen bonding can stabilize a metastable cis-azobenzene derivative in the solid state.
High-rate autotrophic denitrification in a fluidized-bed reactor at psychrophilic temperatures

In this study, high-rate autotrophic denitrification driven by thiosulfate (S2O32-) was maintained under psychrophilic conditions in a lab-scale fluidized-bed reactor (FBR) with a Thiobacillus-dominated biofilm. The temperature effects on the denitrifying performance of the FBR were monitored by gradually decreasing the temperature from 20 to 3°C. The potential of the FBR biofilm to maintain thiosulfate-driven denitrification at 3°C was further investigated at different HRTs (5.4, 3 and 1 h) and influent NO3- concentrations (200, 600 and 1078 mg/L), resulting in a gradual increase of the nitrogen loading rate (NLR) from 0.20 to 3.3 kg N-NO3-/m3 d. Complete thiosulfate-driven denitrification could be maintained at all temperatures, HRTs and influent NO3- concentrations tested. PCR-DGGE analysis revealed the dominance of the sulfur-oxidizing chemolithotrophs T. denitrificans and T. thioparus at all temperatures investigated. The FBR operation at a temperature as low as 3°C promoted bed expansion and increased the dissolved organic carbon (DOC) concentration in the effluent, but had no significant effects on the denitrification efficiency. The findings of this study are highly significant for the treatment of cold nitrogen-contaminated waters poor in organics and confirm the FBR as a robust and powerful bioreactor system for autotrophic denitrification.
Hydrophobin-nanofibrillated cellulose stabilized emulsions for encapsulation and release of BCS class II drugs

The purpose of this study was to construct biopolymer-based oil-in-water emulsion formulations for encapsulation and release of poorly water soluble model compounds naproxen and ibuprofen. Class II hydrophobin protein HFBII from Trichoderma reesei was used as a surfactant to stabilize the oil/water interfaces of the emulsion droplets in the continuous aqueous phase. Nanofibrillated cellulose (NFC) was used as a viscosity modifier to further stabilize the emulsions and encapsulate protein coated oil droplets in NFC fiber network. The potential of both native and oxidized NFC were studied for this purpose. Various emulsion formulations were prepared and the abilities of different formulations to control the drug release rate of naproxen and ibuprofen, used as model compounds, were evaluated. The optimal formulation for sustained drug release consisted of 0.01% of drug, 0.1% HFBII, 0.15% oxidized NFC, 10% soybean oil and 90% water phase. By comparison, the use of native NFC in combination with HFBII resulted in an immediate drug release for both of the compounds. The results indicate that these NFC originated biopolymers are suitable for pharmaceutical emulsion formulations. The native and oxidized NFC grades can be used as emulsion stabilizers in sustained and immediate drug release applications. Furthermore, stabilization of the emulsions was achieved with low concentrations of both HFBII and NFC, which may be an advantage when compared to surfactant concentrations of conventional excipients traditionally used in pharmaceutical emulsion formulations.

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Organisations: Chemistry and Bioengineering, University of Helsinki, VTT Technical Research Centre of Finland, Universita degli Studi di Padova, Italy, Division of Biopharmaceutical Sciences
Authors: Paukkonen, H., Ukkonen, A., Szilvay, G., Yliperttula, M., Laaksonen, T.
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Scopus rating (2016): CiteScore 4.2 SJR 1.223 SNIP 1.499
Scopus rating (2015): SJR 1.156 SNIP 1.415 CiteScore 4.04
Scopus rating (2014): SJR 0.994 SNIP 1.247 CiteScore 3.48
Scopus rating (2013): SJR 1.038 SNIP 1.287 CiteScore 3.47
Scopus rating (2012): SJR 1.254 SNIP 1.425 CiteScore 3.6
Scopus rating (2011): SJR 1.236 SNIP 1.428 CiteScore 3.57
Hexaphyrin as a Potential Theranostic Dye for Photothermal Therapy and $^{19}$F Magnetic Resonance Imaging

Two features of meso-Aryl-substituted expanded porphyrins suggest suitability as theranostic agents. They have excellent absorption in near infrared (NIR) region, and they offer the possibility of introduction of multiple fluorine atoms at structurally equivalent positions. Here, hexaphyrin (hexa) was synthesized from 2,6-bis(trifluoromethyl)-4-formyl benzoate and pyrrole and evaluated as a novel expanded porphyrin with the above features. Under NIR illumination hexa showed intense photothermal and weak photodynamic effects, which were most likely due to its low excited states, close to singlet oxygen. The sustained photothermal effect caused ablation of cancer cells more effectively than the photodynamic effect of indocyanine green (a clinical dye). In addition, hexa showed potential for use in the visualization of tumors by $^{19}$F magnetic resonance imaging (MRI), because of the multiple fluorine atoms. Our results strongly support the utility of expanded porphyrins as theranostic agents in both photothermal therapy and $^{19}$F MRI.

General information

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Scopus rating (2015): SJR 1.255 SNIP 0.748 CiteScore 2.77
Scopus rating (2014): SJR 1.386 SNIP 0.852 CiteScore 2.88
Scopus rating (2013): SJR 1.622 SNIP 0.849 CiteScore 3.15
Scopus rating (2012): SJR 1.853 SNIP 0.902 CiteScore 3.49
Scopus rating (2011): SJR 1.903 SNIP 0.952 CiteScore 3.59
Scopus rating (2010): SJR 1.951 SNIP 0.931
Scopus rating (2009): SJR 1.899 SNIP 0.921
Hierarchical Self-Assembly of Halogen-Bonded Block Copolymer Complexes into Upright Cylindrical Domains

Self-assembly of block copolymers into well-defined, ordered arrangements of chemically distinct domains is a reliable strategy for preparing tailored nanostructures. Microphase separation results from the system, minimizing repulsive interactions between dissimilar blocks and maximizing attractive interactions between similar blocks. Supramolecular methods have also achieved this separation by introducing small-molecule additives binding specifically to one block by noncovalent interactions. Here, we use halogen bonding as a supramolecular tool that directs the hierarchical self-assembly of low-molecular-weight perfluorinated molecules and diblock copolymers. Microphase separation results in a lamellar-within-cylindrical arrangement and promotes upright cylindrical alignment in films upon rapid casting and without further annealing. Such cylindrical domains with internal lamellar self-组装 can be cleaved by solvent treatment of bulk films, resulting in separated and segmented cylindrical micelles stabilized by halogen-bond-based supramolecular crosslinks. These features, alongside the reversible nature of halogen bonding, provide a robust modular approach for nanofabrication.

General Information
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Organisations: Chemistry and Bioengineering, Research group: Supramolecular photochemistry, VTT Technical Research Centre of Finland, Aalto University, Politecnico di Milano, Italian Institute of Technology, Università del Salento
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ASJC Scopus subject areas: Chemistry(all), Chemical Engineering(all), Biochemistry, Environmental Chemistry, Materials Chemistry, Biochemistry, medical
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http://urn.fi/URN:NBN:fi:ttty-201703281227
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Research output: Scientific - peer-review › Article
Optimizing ammonium adsorption on natural zeolite for wastewaters with high loads of ammonium and solids

Ion exchange (IE) has been so far limited to treating waters and wastewaters low in solids (TS) and ammonium (NH$_4^+$). This study provides a new insight into the application of IE for NH$_4^+$ removal from wastewaters with high NH$_4^+$ and TS, using natural zeolite as adsorbent medium. Assays were carried out in continuously stirred batch reactors to study the effect of initial NH$_4^+$, pH, TS, contact time, and zeolite pore size (0.2–0.5 and 0.6–2.0 mm). Results confirmed the suitability of this zeolite to remove NH$_4^+$ from wastewater with high amounts of solids (up to 2% TS) and NH$_4^+$ (up to 2500 mg NH$_4^+$-N/L). Ammonium adsorption capacity ($q_t$) was faster with 0.2–0.5 mm size because of the greater specific surface area and shorter diffusion path than 0.6–2.0 mm zeolite. Both zeolites showed increasing $q_t$ with increasing initial NH$_4^+$ due to the higher driving force produced by higher concentrations. The process followed a pseudo-second order kinetic and was best described by the Freundlich isotherm. Varying the pH (6–8.5) of the wastewater had no effect on NH$_4^+$ removal capacity. In conclusion, this natural zeolite showed high affinity for NH$_4^+$ in wastewater with high loads of NH$_4^+$ and solids, returning a viable treatment method when other techniques are not applicable.

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Organisations: Chemistry and Bioengineering
Authors: Taddeo, R., Prajapati, S., Lepistö, R.
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Publication date: 3 Mar 2017
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Scopus rating (2015): SJR 0.404 SNIP 0.615 CiteScore 1.32
Scopus rating (2014): SJR 0.462 SNIP 0.735 CiteScore 1.44
Scopus rating (2013): SJR 0.497 SNIP 0.884 CiteScore 1.5
Scopus rating (2012): SJR 0.522 SNIP 0.977 CiteScore 1.35
Scopus rating (2011): SJR 0.538 SNIP 0.85 CiteScore 1.33
Scopus rating (2010): SJR 0.418 SNIP 0.465
Scopus rating (2009): SJR 0.455 SNIP 0.527
Scopus rating (2008): SJR 0.448 SNIP 0.496
Scopus rating (2007): SJR 0.481 SNIP 0.634
Scopus rating (2006): SJR 0.435 SNIP 0.59
Scopus rating (2005): SJR 0.383 SNIP 0.621
Scopus rating (2004): SJR 0.441 SNIP 0.764
Scopus rating (2003): SJR 0.428 SNIP 0.673
Scopus rating (2002): SJR 0.489 SNIP 0.552
Scopus rating (2001): SJR 0.582 SNIP 0.762
Scopus rating (2000): SJR 0.547 SNIP 0.963
Scopus rating (1999): SJR 0.573 SNIP 1.008
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ASJC Scopus subject areas: Materials Science(all), Mechanics of Materials, Mechanical Engineering
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Bibliographical note
INT="Prajapati, Sumitra"
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Research output: Scientific - peer-review › Article

Twin-layer biosensor for real-time monitoring of alkane metabolism

Intracellular metabolic sensors can be used for efficient screening and optimization of microbial cell factories. In particular, the sensors are useful in acquiring information about pathway dynamics and bottlenecks in a straightforward manner. Here, we developed a twin-layer biosensor that functions simultaneously at two levels: Through transcription factor mediated sensing and enzyme-metabolite interaction, providing insights into the dynamics of alkane metabolism. In
addition, the sensor can be used for monitoring either alkane degradation or biosynthesis, depending on the used cellular context. Alkanes are monitored using a fluorescent reporter green fluorescent protein placed under a native alkane-inducible promoter, whereas a bacterial luciferase producing bioluminescence signal enzymatically detects a specific metabolic intermediate in the alkane production/degradation pathway. First, we employed the sensor to investigate the native alkane degradation route in Acinetobacter baylyi ADP1. The highest fluorescence and luminescence signals were obtained for dodecane. Second, we constructed a non-native alkane synthesis pathway in A. Baylyi ADP1, of which the functionality was confirmed with the sensor. The twin-layer approach provides convenient means to study and optimize the kinetics and performance of the heterologous pathway and will facilitate the development of an efficient cell factory.

Origin and fate of methane in the Eastern Tropical North Pacific oxygen minimum zone

Oxygen minimum zones (OMZs) contain the largest pools of oceanic methane but its origin and fate are poorly understood. High-resolution (<15m) water column profiles revealed a 300m thick layer of elevated methane (20–105 nM) in the anoxic core of the largest OMZ, the Eastern Tropical North Pacific. Sediment core incubations identified a clear benthic methane source where the OMZ meets the continental shelf, between 350 and 650m, with the flux reflecting the concentration of methane in the overlying anoxic water. Further incubations characterised a methanogenic potential in the presence of both porewater sulphate and nitrate of up to 88 nmol·g−1·day−1 in the sediment surface layer. In these methane-producing sediments, the majority (85%) of methyl coenzyme M reductase alpha subunit (mcrA) gene sequences clustered with Methanosarcinaceae (greater than or equal to96% similarity to Methanococcoides sp.), a family capable of performing non-competitive methanogenesis. Incubations with 13C-CH4 showed potential for both aerobic and anaerobic methane oxidation in the waters within and above the OMZ. Both aerobic and anaerobic methane oxidation is
corroborated by the presence of particulate methane monooxygenase (pmoA) gene sequences, related to type I methanotrophs and the lineage of Candidatus Methylomirabilis oxyfera, known to perform nitrite-dependent anaerobic methane oxidation (N-DAMO), respectively.

**General information**
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- **Ministry of Education publication type:** A1 Journal article-refereed
- **Organisations:** Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Department of Environmental Sciences, University of Helsinki, Faculty of Life Sciences, University of Manchester
- **Authors:** Chronopoulou, P., Shelley, F., Pritchard, W. J., Maanoja, S. T., Trimmer, M.
- **Number of pages:** 14
- **Pages:** 1-14
- **Publication date:** 28 Feb 2017
- **Peer-reviewed:** Yes

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- **Journal:** ISME Journal
- **ISSN (Print):** 1751-7362
- **Ratings:**
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  - Scopus rating (2015): SJR 6.087 SNIP 2.363 CiteScore 9.64
  - Scopus rating (2014): SJR 5.056 SNIP 2.181 CiteScore 8.42
  - Scopus rating (2013): SJR 4.71 SNIP 2.175 CiteScore 8.62
  - Scopus rating (2012): SJR 4.673 SNIP 2.07 CiteScore 8.02
  - Scopus rating (2011): SJR 3.536 SNIP 1.777 CiteScore 6.5
  - Scopus rating (2010): SJR 3.245 SNIP 1.626
  - Scopus rating (2009): SJR 2.563 SNIP 1.445
  - Scopus rating (2008): SJR 1.97 SNIP 0.766
- **Original language:** English
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- **Links:**
  - Research output: Scientific - peer-review » Article

**UV exposure in artificial and natural weathering: A comparative study**

We report on a study focusing on UV exposure conditions in three different types of chambers used for accelerated ageing of materials. The first chamber is equipped with four 300-W UVA/UVB mercury vapour lamps (Ultra-Vitalux/Osram). The second chamber uses four 40-W UVA fluorescent lamps (QUV-340/Q-Lab). The third chamber is Weather-Ometer Ci3000+ from Atlas with a 4500-W xenon arc lamp. UV irradiance prevailing in each chamber was measured using Bentham DM150 double monochromator spectroradiometer. The results were compared to measurements of solar spectral UV irradiance at Jokioinen, Finland, with a Brewer MkIII double monochromator spectrophotometer. The spectral shapes of the exposing UV radiation in the different chambers were found to notably differ from each other and from the solar UV spectrum. Both spatial inhomogeneities and temporal variability caused by various factors, like the ageing of the lamps, were detected. The effects were found to strongly depend on wavelength of the exposing UV radiation. The findings of this study underline the necessity of careful characterization of the UV exposure conditions provided by the facilities used in accelerated testing of materials.

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- **Ministry of Education publication type:** A4 Article in a conference publication
- **Organisations:** Materials Science, Chemistry and Bioengineering, Research area: Design, Development and LCM, Finnish Meteorological Institute, World Radiation Cent, Aalto University, Paper Converting and Packaging Technology, Independent Researcher
- **Authors:** Heikkilä, A., Kazadzis, S., Meinander, O., Vaskuri, A., Kärhä, P., Mylläri, V., Syrjälä, S., Koskela, T.
- **Publication date:** 22 Feb 2017

**Host publication information**
- **Title of host publication:** RADIATION PROCESSES IN THE ATMOSPHERE AND OCEAN (IRS2016): Proceedings of the International Radiation Symposium (IRCI/AMAS)
- **Publisher:** American Institute of Physics
Optimization of convectively cooled heat sinks

Many factors of heat sink, such as its size and mass, component locations, number of fins, and fan power affect heat transfer. Owing to the opposite effects of these factors on heat sink maximum temperature, we have now a multi-objective optimization problem. A typical optimization case consists of hundreds of heat sink temperature field evaluations, which would be impractical to do with CFD. Instead, we propose to combine analytical results of convection and numerical solution of conduction to address these so-called conjugated heat transfer problems. We solve heat conduction in a solid numerically using the finite volume method and tackle convection with the analytical equation of forced convection in a parallel plate channel. This model is suitable for forced and natural convection heat sinks, and we have verified its validity by comparing its results to measured data and CFD calculations. We use the model to improve two industrial examples, using a multi-objective version of the particle swarm optimization (PSO) algorithm. The first example is a forced convection heat sink composed of nine heat generating components at the base plate, and the other is a natural convection case with two components. In both cases, mass is minimized; the other criterion is maximum temperature for the forced convection case and heat sink outer volume for the natural convection case. Our method is many orders of magnitude faster than CFD. Additionally, we provide some LES results of pin fins with natural convection for further use in similar optimizations.
Benchmarking DFT methods with small basis sets for the calculation of halogen-bond strengths

In recent years, halogen bonding has become an important design tool in crystal engineering, supramolecular chemistry and biosciences. The fundamentals of halogen bonding have been studied extensively with high-accuracy computational methods. Due to its non-covalency, the use of triple-zeta (or larger) basis sets is often recommended when studying halogen bonding. However, in the large systems often encountered in supramolecular chemistry and biosciences, large basis sets can make the calculations far too slow. Therefore, small basis sets, which would combine high computational speed and high accuracy, are in great demand. This study focuses on comparing how well density functional theory (DFT) methods employing small, double-zeta basis sets can estimate halogen-bond strengths. Several methods with triple-zeta basis sets are included for comparison. Altogether, 46 DFT methods were tested using two data sets of 18 and 33 halogen-bonded complexes for which the complexation energies have been previously calculated with the high-accuracy CCSD(T)/CBS method. The DGDZVP basis set performed far better than other double-zeta basis sets, and it even outperformed the triple-zeta basis sets. Due to its small size, it is well-suited to studying halogen bonding in large systems.

General information
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Scopus rating (2015): SJR 0.454 SNIP 0.589 CiteScore 1.35
Scopus rating (2014): SJR 0.51 SNIP 0.727 CiteScore 1.69
Scopus rating (2013): SJR 0.523 SNIP 0.734 CiteScore 1.94
Scopus rating (2012): SJR 0.571 SNIP 0.679 CiteScore 1.66
Scopus rating (2011): SJR 0.52 SNIP 0.773 CiteScore 1.7
Scopus rating (2010): SJR 0.919 SNIP 1.148
Scopus rating (2009): SJR 0.752 SNIP 1.025
Scopus rating (2008): SJR 0.75 SNIP 0.719
Scopus rating (2007): SJR 0.637 SNIP 0.75
Scopus rating (2006): SJR 0.466 SNIP 0.532
Scopus rating (2005): SJR 0.542 SNIP 0.668
Scopus rating (2004): SJR 0.977 SNIP 1.158
Scopus rating (2003): SJR 0.925 SNIP 1.027
Scopus rating (2002): SJR 0.561 SNIP 0.676
Scopus rating (2001): SJR 0.583 SNIP 0.611
Scopus rating (2000): SJR 0.502 SNIP 0.471
Scopus rating (1999): SJR 0.727 SNIP 0.566

Original language: English
Keywords: Basis set, Benchmarking, Density functional theory, Halogen bonding
This study investigated the potential of a fluidized-bed biofilm dominated by Thiobacillus denitrificans to sustain thiosulfate-driven denitrification under increasingly acidic conditions. A fluidized-bed reactor (FBR) performing denitrification via thiosulfate (S2O32−) oxidation of a nitrate-contaminated synthetic wastewater was first operated under decreasing feed pH values from 7.00 to 5.25. Denitrification efficiency > 99% was observed even at feed and effluent pH of 5.75 and 5.30, respectively. At lower feed pH values, the denitrification efficiency decreased rapidly due to inorganic carbon deficiency. The addition of a carbonation unit continuously feeding anaerobic grade CO2 to the FBR biofilm allowed to investigate denitrification at pH values lower than 5.0. This new configuration, i.e. FBR with a carbonation unit, was able to sustain a complete and stable denitrification even at pH as low as 4.75. Denaturing gradient gel electrophoresis (DGGE) showed the evolution of the denitrifying biofilm during the FBR operation, resulting in a robust and high-performing mixotrophic consortium of chemolithotrophic and heterotrophic bacteria dominated by T. denitrificans. Batch activity tests performed at three different stages of the FBR operation (feed pH 7.0, 6.0 and 5.25) showed that low pH cultivation enhanced the denitrification activity (mg N/g VS d) of the FBR biofilm at acidic pH values.

**General information**

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Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry

Authors: Di Capua, F., Lakaniemi, A., Puhakka, J. A., Lens, P. N. L., Esposito, G.

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Scopus rating (2014): SJR 1.703 SNIP 1.981 CiteScore 4.92
Scopus rating (2013): SJR 1.602 SNIP 1.914 CiteScore 4.59
Scopus rating (2012): SJR 1.517 SNIP 1.85 CiteScore 3.92
Scopus rating (2011): SJR 1.39 SNIP 1.762 CiteScore 3.96
Scopus rating (2010): SJR 1.243 SNIP 1.526
Scopus rating (2009): SJR 1.109 SNIP 1.498
Scopus rating (2008): SJR 1.056 SNIP 1.513
Scopus rating (2007): SJR 1.121 SNIP 1.52
Scopus rating (2006): SJR 0.982 SNIP 1.251
Scopus rating (2005): SJR 1.113 SNIP 1.482
Scopus rating (2004): SJR 0.916 SNIP 1.39
Scopus rating (2003): SJR 0.848 SNIP 1.109
Scopus rating (2002): SJR 0.692 SNIP 0.983
Scopus rating (2001): SJR 0.672 SNIP 0.854
Scopus rating (2000): SJR 0.611 SNIP 0.738
Scopus rating (1999): SJR 0.391 SNIP 0.805

Original language: English

Keywords: Acidic wastewater treatment, Autotrophic denitrification, Chemolithotrophic denitrifiers, Fluidized-bed reactor, Mixotrophic biofilm, Thiosulfate

DOIs:

10.1016/j.cej.2016.10.117
The Role of Inorganics in Biomass Gasification: Catalytic Effects on Char Reactions and Toxic Emissions

This thesis studied the role of inorganic elements in biomass gasification, focusing on catalytic effects in char gasification and removal of toxic metals from the product gas. A combination of experimental, including gasification using thermogravimetric analysis and fluidized beds, and modeling techniques were used.

Spruce and birch woods were leached of the naturally occurring ash forming elements and loaded with varying amounts of calcium or potassium. These woods were then gasified in either an isothermal thermogravimetric analysis device or a bubbling fluidized bed reactor. In the case of the spruce wood gasified using the thermogravimetric analysis device, char conversion models were evaluated against the measured data and an empirical model was developed which uses the concentration of calcium and potassium in wood to predict the conversion rate behavior of the char when gasified in CO2. The results from the fluidized bed gasification tests of birch wood showed that calcium was the primary active catalyst in the wood and the increased reactivity resulting from calcium doping was clear even in the much larger scale of a fluidized bed compared to the thermogravimetric analysis. The potassium doped samples did not exhibit increased reactivity in the fluidized bed due to a nonreactive layer of secondary char being deposited on the char surface.

The behavior of arsenic in the product gas of chromated-copper arsenate wood was modeled using equilibrium calculations and measured experimentally in a bubbling fluidized bed. The equilibrium model accurately predicted that the product gas could be cleaned by cooling the gas below 260°C and filtering to remove condensed arsenic.

While there are methods for modeling the effects of inorganics in catalyzing char gasification, further research into interconnected issues of surface area, pore sizes, pyrolysis conditions and inorganic concentrations is needed. Similarly, while equilibrium modeling has been shown to predict the behavior of arsenic during gasification in some cases, there are many gaps in understanding which arsenic compounds are most relevant.

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Enhancing the activity of iron-oxidising bacteria: A case study with process liquors from heap bioleaching of a complex sulphide ore

In the present study, six process liquors (PL1 - PL6) originating from heap bioleaching of a complex sulphide ore were examined to reveal factors limiting microbial activity in the bioheaps. PL4 had the lowest iron oxidation activity even though its indigenous iron-oxidising community was diverse (Acidithiobacillus, Leptospirillum, Acidiferrobacter, and Sulfobacillus species). Shake flask experiments at 27 °C revealed that ferrous iron (Fe2+) and aluminium (Al3+) concentrations up to 16 and 12 g/L, respectively, were not inhibitory for the iron-oxidising microorganisms in PL4. In addition, Al3+ concentrations of ≤ 6 g/L were shown to enhance iron oxidation rates. High correlation between increased concentrations of cadmium (Cd), sulphate (SO42−), and vanadium (V) and decreased iron oxidation rates was detected when comparing process liquors 1–6. Moreover, possible nutrient limitation in PL4 was delineated by selectively supplementing it with macro- and micronutrients. Supplementation of 320 mg/L of nitrogen (as NH4+) to PL4 significantly increased iron oxidation rates from 20 mg/L/h (no nutrient supplementation) to 160 mg/L/h and would likely also enhance
the heap bioleaching process. Additionally, microorganisms growing in high inhibitory ion concentrations (e.g. Cd2+) were shown to be more sensitive to nitrogen deficiency than microorganisms growing in more dilute liquors.

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Scopus rating (2013): SJR 1.626 SNIP 2.967 CiteScore 2.95
Scopus rating (2012): SJR 1.523 SNIP 2.4 CiteScore 2.6
Scopus rating (2011): SJR 1.521 SNIP 1.796 CiteScore 2.42
Scopus rating (2010): SJR 1.104 SNIP 1.672
Scopus rating (2009): SJR 1.185 SNIP 2.458
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Scopus rating (2006): SJR 0.972 SNIP 1.482
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Scopus rating (2004): SJR 1.089 SNIP 1.869
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**Adsorption of furfural from torrefaction condensate using torrefied biomass**

Torrefaction is a biomass energy densification process that generates a major byproduct in the form of torrefaction condensate. Microbial conversion of torrefaction condensate could be an attractive option for energy integration within torrefaction process. However, torrefaction condensate contains several compounds, such as furfural, 5-hydroxymethylfurfural and guaiacol that are inhibitory to microbes. In this study, for the first time, we reported detoxification of torrefaction condensate, by removing the major inhibitory compound furfural, using torrefied biomass and later used the detoxified torrefaction condensate for anaerobic digestion. The effect of varying torrefaction temperature (225–300 °C), torrefied biomass dosage (25–250 g/L), initial pH (2.0–9.0), and contact time (1–12 h) on furfural adsorption was studied with batch adsorption experiments. The furfural adsorption on torrefied biomass was best represented by pseudo second order kinetic model. The adsorption of furfural and other inhibitory compounds on torrefied biomass was likely a hydrophobic interaction. A maximum of 60% of furfural was adsorbed from torrefaction condensate containing 9000 mg furfural/L using 250 g/L of torrefied biomass in batch adsorption. For, column (20 mm internal diameter and 200 mm bed height), the saturation time for furfural adsorption was around 50 min. Anaerobic digestion of the detoxified
torrefaction condensate shows that the lag phase in methane production was reduced from 25 d to 15 d for 0.2 volatile solid (VS) substrate:VS inoculum loading. The study shows that torrefaction condensate can be effectively detoxified using torrefied biomass for microbial conversion and can be integrated within the torrefied biomass pellet production process.

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Authors: Doddapaneni, T. R. K. C., Jain, R., Praveenkumar, R., Rintala, J., Romar, H., Konttinen, J.
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Scopus rating (2002): SJR 0.692 SNIP 0.983
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Research output: Scientific - peer-review › Article

A light-driven artificial flytrap
The sophistication, complexity and intelligence of biological systems is a continuous source of inspiration for mankind. Mimicking the natural intelligence to devise tiny systems that are capable of self-regulated, autonomous action to, for example, distinguish different targets, remains among the grand challenges in biomimetic micro-robotics. Herein, we demonstrate an autonomous soft device, a light-driven flytrap, that uses optical feedback to trigger photomechanical actuation. The design is based on light-responsive liquid-crystal elastomer, fabricated onto the tip of an optical fibre, which acts as a power source and serves as a contactless probe that senses the environment. Mimicking natural flytraps, this artificial flytrap is capable of autonomous closure and object recognition. It enables self-regulated actuation within the fibre-sized architecture, thus opening up avenues towards soft, autonomous small-scale devices.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
A method for the condensation of boroxazolidones derived from L-valine with aromatic aldehydes, catalysed by 1,5,7-triazabicyclo[4.4.0]dec-5-ene was developed. The preparation and isolation of a series of highly functionalised stable ketimines derived from the reaction of 2,2-diaryl-1,3,2-oxazaborolidin-5-ones with aryl aldehydes is herein described. Several unreported boroxazolidones were prepared by condensation of triethylammonium tetra-arylborates with L-valine in up to 98% yield. The newly synthesised compounds were determined to be moderately cytotoxic against colorectal adenocarcinoma cells, with the best compound in this series having an IC50 of 76 μM. A brief inspection of the effect of the same compound against human brain astrocytoma cells showed an IC50 of 268 μM.
Bioelectrochemical Systems for Heavy Metal Removal and Recovery

Although metal bearing wastes are toxic, they possess economic value and hence need attention towards remediation/recovery. Various physical and chemical methods are being practiced for treating metal laden wastewaters, but are limited owing to the problems associated with maintenance and operational costs. Biological methods that use microbes as catalyst are cost effective and easy to operate, but only a little progress has been made in terms of recovery than the treatment. Recently, there is a shift in focus from bioremediation of metal wastes towards the recovery of valuable metals which are scanty. In this context, bioelectrochemical systems (BES) have emerged as a potential technological platform for recovery of metal ions from metallurgical waste (end-of-life products), process streams and wastewaters. In bioelectrochemical systems, microbial oxidation of organic substrate at the anode is coupled to abiotic or biotic reduction of metal ions at the cathode. With this perspective, this chapter gives an insight on the redox mechanisms of bacteria towards metal recovery along with the influence of in situ and ex situ potentials in bioelectrochemical systems. The exo-electron transport mechanism in bacteria for metal reduction and speciation is also discussed. Besides, the chapter also provides an overview on the metal speciation in bioelectrochemical systems along with electrochemical, physical and chemical methods for metal removal and recovery from wastewaters. Emerging metal recovery concepts based on bioelectrochemical systems are also presented in detail.

Biological removal of selenate and ammonium by activated sludge in a sequencing batch reactor

Wastewaters contaminated by both selenium and ammonium need to be treated prior to discharge into natural water bodies, but there are no studies on the simultaneous removal of selenium and ammonium. A sequencing batch reactor (SBR) was inoculated with activated sludge and operated for 90 days. The highest ammonium removal efficiency achieved was 98%, while the total nitrogen removal was 75%. Nearly a complete chemical oxygen demand removal efficiency was attained after 16 days of operation, whereas complete selenate removal was achieved only after 66 days. The highest total Se removal efficiency was 97%. Batch experiments showed that the total Se in the aqueous phase decreased by 21% with increasing initial ammonium concentration from 50 to 100 mg L$^{-1}$. This study showed that SBR can remove both selenate and ammonium via, respectively, bioreduction and partial nitrification-denitrification and thus offer possibilities for treating selenium and ammonium contaminated effluents.
Biological Sulphate Reduction

During construction, renovation and/or demolition activities, large amounts of construction and demolition debris are created. This debris contains high sulphate concentrations and toxic metals, which can create a lot of environmental problems, especially at landfill sites. The disposal of the debris can cause odour problems and possible health impacts to landfill staff and surrounding inhabitants due to hydrogen sulphide gas generation. In order to reuse this debris, sulphate and heavy metal have to be removed. This chapter reviews the technologies used for sulphate and heavy metal removal from the debris both by chemical and biological processes. Moreover, possible ways for sulphur recovery has been reviewed. A sulphate removal efficiency up to 99% can be achieved from the chemical sulphate removal process. However, for this high performance, toxic chemicals such as barium and lead compounds have to be used. The biological sulphate reduction process is an alternative method for sulphate removal and recovery of sulphur and heavy metals from debris. Sulphide which is the product of this bio-process can be easily precipitated together with dissolved metal as metallic sulphides. Moreover, sulphide produced in this process can also be recovered as elemental sulphur or sulphuric acid.
Biorecovery of Metals from Electronic Waste

Electronic waste, termed interchangeably as e-waste and/or waste electrical and electronic equipment (WEEE), is the fastest-growing segment of solid waste. The global electronic waste generation has reached 42 million tons in 2014, and is expected to reach 50 million tons in 2020. In addition to being a hazardous waste type, WEEE also includes relatively high concentrations of metals. Modern devices contain up to 60 different elements at various concentrations, encompassing base metals, critical metals, and platinum group metals mixed in a complex matrix of metallic and non-metallic materials. The emergence of numerous new electronic products and occurrence of complex metal mixtures make this waste stream an important secondary source of metals. Improper and informal end-of-life (EoL) processing of electronic waste has detrimental consequences on the environment and public health. Microbial processing of metals from their primary ores is an established technology with many full-scale applications. Bioprocessing of waste materials for metal recovery, on the other hand, is an emerging and promising technology with low environmental impact and high cost-effectiveness. This chapter overviews bioprocessing of electronic waste as a secondary source of metals to recover metals. Additionally, biologically-driven metal extraction technologies, (e.g. bioleaching) and metal recovery techniques (e.g. biomineralisation) are reviewed.
**Biosynthesis of CdSe nanoparticles by anaerobic granular sludge**

This study investigated the feasibility of combining bioremediation of selenium (Se) containing wastewater and biorecovery of Se as cadmium selenide nanoparticles (CdSe NPs). A microbial community of anaerobic granular sludge was enriched for 300 days in the presence of Cd(ii) and selenite (Se(iv)). Complete Se(iv) (79 mg L\(^{-1}\)) reduction in the presence of Cd (30 mg L\(^{-1}\)) was observed after the 16th transfer (8 months) with the formation of both elemental selenium (Se(0)) and dissolved selenide (Se(-ii)). Cd either was associated with Se(0) or remained in the aqueous phase as free Cd(ii) ions and/or CdSe. The absorption and the fluorescence spectra of the aqueous phase showed formation of CdSe NPs. UV-vis and X-ray photoelectron spectroscopy (XPS) confirmed that the CdSe NPs were capped by extracellular polymeric substances (EPS) originating from the anaerobic granular sludge. Raman spectroscopy and XPS analysis further confirmed the presence of CdSe NPs in the aqueous phase, while Cd present in the Se(0) pellet after centrifugation was mainly precipitated as a Se(0)-Cd complex. A CdSe/CdS core/shell structure was found in the sludge, suggesting that Cd(ii) ions on the surface of the CdSe core interact with the sulfhydryl (-SH) groups present in the EPS of the UASB granules.

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Source-ID: 85017546806  
Research output: Scientific - peer-review > Article

**Controlling azobenzene photoswitching through combined ortho-fluorination and -amination**

We present a series of visible-light-absorbing azobenzene photoswitches with cis-lifetimes ranging from one second to three days. We combine ortho-fluorination to control the cis-lifetimes, and ortho-amination to boost the visible-light absorption. The synthesis is accomplished by selectively replacing one or more ortho-fluorines with amines in the ortho-fluoroazobenzene precursors.

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Authors: Ahmed, Z., Siiskonen, A., Virkki, M., Priimägi, A.  
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Cultivation of Scenedesmus acuminatus in different liquid digestates from anaerobic digestion of pulp and paper industry biosludge

Different undiluted liquid digestates from mesophilic and thermophilic anaerobic digesters of pulp and paper industry biosludge with and without thermal pretreatment were characterized and utilized for cultivating Scenedesmus acuminatus. Higher S. acuminatus biomass yields were obtained in thermophilic digestates (without and with pretreatment prior to anaerobic digestion (AD): 10.2 ± 2.2 and 10.8 ± 1.2 g L\(^{-1}\), respectively) than in pretreated mesophilic digestates (7.8 ± 0.3 g L\(^{-1}\)), likely due to differences in concentration of sulfate, iron, and/or other minor nutrients. S. acuminatus removed over 97.4% of ammonium and 99.9% of phosphate and sulfate from the digestates. Color (74–80%) and soluble COD (29–39%) of the digestates were partially removed. Different AD processes resulted in different methane yields (18–126 L CH\(_4\) kg\(^{-1}\) VS), digestate compositions, and microalgal yields. These findings emphasize the importance of optimizing each processing step in wood-based biorefineries and provide information for pulp and paper industry development for enhancing value generation.

General information

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Authors: Tao, R., Lakaniemi, A., Rintala, J. A.
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Publication information

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Difference in the core-shell dynamics of polyethyleneimine and poly(l-lysine) DNA polyplexes

Electrostatic polymer-DNA complexes (polyplexes) have been widely investigated for DNA delivery, and remarkable differences in transfection efficacy have been seen among the materials. For example, polyethyleneimine (PEI) mediates DNA transfection more effectively than poly(l-lysine) (PLL). Biophysical properties of the polyplexes may explain their different properties in gene delivery. We investigated the structural dynamics in DNA polyplexes, especially the material exchange between the core and shell regions of the PEI and PLL polyplexes. Steady-state fluorescence spectroscopy and double labeling based fluorescence resonance energy transfer (FRET) techniques were used to study the DNA polyplexes. According to our results there is a clear difference between these two polymers: core exchange takes place in PEI but not in PLL polyplexes. Such differences in structural dynamics of polyplexes explain, at least partly, the differences in DNA release and transfection efficacy at cellular level.

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Organisations: Chemistry and Bioengineering, Research group: Supramolecular photochemistry, University of Helsinki, Ita-Suomen yliopisto, Universita degli Studi di Padova, Italy
Authors: Vuorimaa-Laukkanen, E., Lisitsyna, E. S., Ketola, T., Morin-Pickardat, E., Liang, H., Hanzlíková, M., Yliperttula, M.
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Scopus rating (2014): SJR 0.994 SNIP 1.247 CiteScore 3.48
Scopus rating (2013): SJR 1.038 SNIP 1.287 CiteScore 3.47
Scopus rating (2012): SJR 1.254 SNIP 1.425 CiteScore 3.6
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Scopus rating (2008): SJR 1.015 SNIP 1.265
Effects of orientation at the phthalocyanine-CdSe interface on the electron transfer characteristics

A phthalocyanine molecule adsorbed on the (1010) surface of wurtzite CdSe is theoretically modeled by the DFT method. We have found that a linker does not affect substantially the redox properties of phthalocyanine, while saturation of the macrocycle with peripheral substituent groups causes a downward shift in the energy position of its frontier orbitals that can hinder electron injection to the CdSe surface. Tilting of the phthalocyanine molecule relative to the surface also leads to the lowering of its molecular electronic levels relative to the bands of CdSe. At a tilting angle of 30°, the LUMO level of the dye appears to be lower than the conduction band minimum of cadmium selenide, which makes the electron transfer to its hybridized surface unfavorable. By contrast, the HOMO level of the phenylbutyric acid linker provides a suitable intermediate channel for the hole transfer from the valence band of CdSe to the phthalocyanine that points to the possible acceptor behavior of the phthalocyanine molecule in its hybrids with CdSe nanostructures.

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Scopus rating (2011): SJR 1.697 SNIP 1.203 CiteScore 3.6
Scopus rating (2010): SJR 1.802 SNIP 1.196
Scopus rating (2009): SJR 2.127 SNIP 1.369
Scopus rating (2008): SJR 2.158 SNIP 1.211
Scopus rating (2007): SJR 1.84 SNIP 1.138
Scopus rating (2006): SJR 1.467 SNIP 1.128
Scopus rating (2005): SJR 1.389 SNIP 1.104
Scopus rating (2004): SJR 1.173 SNIP 1.007
Electronic waste as a secondary source of critical metals: Management and recovery technologies

The wealth of the society depends on several metals, including base metals, precious metals and increasingly rare earth elements (REE). They are collectively termed as technology metals. Numerous applications stimulated the use of technology metals, and their supply is at stake, owing to the high demand and uneven geographical distribution of these metals. Their stable supply is crucial for the transition to a sustainable and circular economy. There is an increasing interest in secondary sources of these metals. This article outlines the global state of electronic waste, its management and the latest technological developments in metal recovery from various streams of electronic waste. An emphasis is given to printed circuit boards (PCB), hard disc drives (HDD) and displays regarding their critical metal content. Physical, pyrometallurgical and (bio)hydrometallurgical metal recovery technologies are overviewed. In addition, perspectives on electronic waste as a secondary source of critical metals are given.
Evaluation of long-term post process inactivation of bioleaching microorganisms

The H2020 BioMOre project (www.biomore.info, Grant Agreement #642456) tests the feasibility of in-situ bioleaching of copper in deep subsurface deposits in the Rudna Mine, Poland. Copper is leached using biologically produced ferric iron solution, which is recycled back to the in-situ reactor after re-oxidation by iron-oxidizing bacteria (IOB). From a post operational point of view, it is important that the biological processes applied during the operation can be controlled and terminated. Our goal was to determine the possibility to use natural saline mine water for the inactivation of introduced IOB remaining in the in-situ reactor after completion of the leaching process of the Kupferschiefer ore. Aerobic and anaerobic microcosms containing acid-leached (pH 2) sandstone or black shale from the Kupferschiefer in the Rudna mine were further leached with the effluent from an iron-oxidizing bioreactor, at a temperature of 30°C, for 10 days, to simulate in-situ leaching. After the removal of the iron solution, residing IOB were inactivated by filling the microcosms with saline water (65 g L⁻¹ Cl⁻) originating from the mine. The saline water completely inactivated the IOB and the naturally occurring saline water of the mine can be used for long-term post process inactivation of bioleaching microorganisms.

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Fin-and-tube heat exchanger enhancement with a combined herringbone and vortex generator design

Vortex generators (VGs) are the most commonly investigated enhancement methods in the field of improved heat exchangers. The aim of present work is to study the effect of VGs in a fin-and-tube heat exchanger (FTHE) with herringbone fin shape. The delta winglet VG design with length (s) and height (H) is selected based on previous studies. The investigated VG design is simple and considered realistic from the manufacturing point of view. The combined enhancement with herringbone fin and the VG is evaluated by simulating the conjugate heat transfer and the air flow. The structured mesh is created for both solid and fluid domains to solve the model numerically using a coupled open source solver in OpenFOAM. The influence of flow condition on the performance enhancement is studied by changing the Reynolds number in a range Re=1354–6157. The study showed that VGs not only increase the heat transfer in the herringbone fin but also decrease the pressure drop. The highest and longest investigated VG design is found to perform the best because of its ability to delay the flow detachment from the tube, to feed high kinetic energy flow to the recirculation zone and to create longitudinal vortices in the downstream region from the VG. The fin with VG design s=0.5D and H=0.6Fp enhances the overall performance by 5.23% in comparison to the fin without VG. The results demonstrated the usefulness of VGs for the performance enhancement in connection with a herringbone fin design.

General information
Fluorescence spectroscopy "knife" for polyplex "cakes": taste the filling

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High resolution E-jet printed temperature sensor on artificial skin
Skin-conformable electronics research field has grown rapidly during the recent years. Body monitoring systems are shrinking in size and integrating more seamlessly with the human skin. To make these monitoring systems feasible options, new suitable materials and manufacturing processes needs to be studied. This paper presents materials and a simple fabrication process for skin-conformable, E-jet printed silver temperature sensors. Utilizing printing processes and biodegradable substrate materials, the skin-conformable electronics may become attractive for disposable systems by
decreasing the manufacturing costs and reducing the amount of waste materials. In this study, the temperature sensors are fabricated with E-jet printed silver nanoparticle ink and the printing is done on a bacterial nanocellulose substrate. During the characterization, the silver temperature sensors were able to reach more than 0.06 % resistance change per degree Celsius sensitivity and they exhibited positive temperature dependence.

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**Identification of feasible pathway information for c-di-GMP binding proteins in cellulose production**

In this paper, we utilize a machine learning approach to identify the significant pathways for c-di-GMP signaling proteins. The dataset involves gene counts from 12 pathways and 5 essential c-di-GMP binding domains for 1024 bacterial genomes. Two novel approaches, Least absolute shrinkage and selection operator (Lasso) and Random forests, have been applied for analyzing and modeling the dataset. Both approaches show that bacterial chemotaxis is the most essential pathway for c-di-GMP encoding domains. Though popular for feature selection, the strong regularization of Lasso method fails to associate any pathway to MshE domain. Results from the analysis may help to understand and emphasis to the supporting pathways involved in bacterial cellulose production. These findings demonstrate the need for a chassis to restrict the behavior or functionality by deactivating the selective pathways in cellulose production.

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Influence of TiO₂ compact layer precursor on the performance of perovskite solar cells

The optimization of the hole-blocking layer in perovskite solar cells (PSC), typically based on TiO₂, is crucial, as it strongly affects the device performance. In this work, we thoroughly characterize the thickness, roughness, and crystal structure of a set of TiO₂ compact layers produced by spin coating of different precursor sols and correlate the choice of the TiO₂ precursor to the photovoltaic performance of the PSC. By replacing the commonly used titanium isopropoxide (TTIP) blocking layer precursor with titanium tetrachloride (TiCl₄), a clear enhancement in the PSC performance was observed, particularly in the hysteresis behavior and stability. The results from the morphological/structural analysis and transient photoluminescence studies clarify the different behavior of the compact layers in PSCs.
Leaching and Recovery of Metals

Sludges, dusts, residues and other wastes originating from ferrous and non-ferrous metallic industries pose a serious environmental threat, if not disposed properly. Disposal of these wastes is expensive and remediation is a necessary step to be implemented to control the adverse environmental effects if disposal is done improperly. Since the past couple of decades, the world’s high-grade metal reserves have been depleted considerably, but the demand for metals in day-to-day life in this electronic era is growing rapidly. The depletion of high-grade ores urges the mineral industry to look for alternative resources for metal extraction. Sludges, dusts, and other wastes generated by the metallurgical industries are interesting options as they still contain significant amounts of valuable base and heavy metals, sometimes even precious metals like gold and silver and also rare earth elements, depending on the nature of the mining site and composition of the primary ores used. This chapter overviews various hydrometallurgical and bio-hydrometallurgical leaching processes for the extraction of metals from these wastes. Different strategies of metal recovery such as solvent-extraction, electrowinning, bio/chemical sorption and bio/chemical precipitation from the wastes generated by various ferrous and non-ferrous metallic industries are overviewed.

Leaching and Recovery of Molybdenum from Spent Catalysts

Spent catalysts are generated in large quantities as solid waste on a yearly basis. Owing to their hazardous nature, environmental regulations for discarded spent catalysts are very strict. Consequently, from the ecological and economical viewpoint, metal recovery from spent catalysts is very important. Molybdenum (Mo) is one of the elements present in spent catalysts at high concentrations. The rapidly growing demands for Mo and its products create a need to develop novel recovery processes from secondary resources, i.e. spent catalysts, as there is a projected shortage of the primary resources for this element. This chapter overviews: (i) the general characteristics of Mo along with the research conducted in recent years concerning Mo chemical leaching, i.e. with strong inorganic acids, sodium hydroxide, hydrogen peroxide and acid mixtures, (ii) Mo bioleaching, i.e. with bacteria Acidithiobacillus ferrooxidans, Acidithiobacillus thiooxidans and Acidianus brierleyi or fungi Penicillium simplicissimum and Aspergillus niger and (iii) Mo recovery, i.e. precipitation, adsorption, ion exchange and solvent extraction, from spent catalysts. Chemical leaching offers Mo leaching yields exceeding 90%. Sulphuric acid seems to be the best leachant owing to its high oxidising power. Bioleaching offers more cost-efficient, simpler and more environmentally friendly processes. However, bioleaching has relatively long leaching cycles (usually around 20 days) and extraction efficiencies of Mo are below 70%. Among the recovery techniques, solvent extraction is well-established in hydrometallurgy for commercial production of high purity Mo.
Light-Driven, Caterpillar-Inspired Miniature Inching Robot

Liquid crystal elastomers are among the best candidates for artificial muscles, and the materials of choice when constructing microscale robotic systems. Recently, significant efforts are dedicated to designing stimuli-responsive actuators that can reproduce the shape-change of soft bodies of animals by means of proper external energy source. However, transferring material deformation efficiently into autonomous robotic locomotion remains a challenge. This paper reports on a miniature inching robot fabricated from a monolithic liquid crystal elastomer film, which upon visible-light excitation is capable of mimicking caterpillar locomotion on different substrates like a blazed grating and a paper surface. The motion is driven by spatially uniform visible light with relatively low intensity, rendering the robot “human-friendly,” i.e., operational also on human skin. The design paves the way toward light-driven, soft, mobile microdevices capable of operating in various environments, including the close proximity of humans.
Light Robots: Bridging the Gap between Microrobotics and Photomechanics in Soft Materials

For decades, roboticists have focused their efforts on rigid systems that enable programmable, automated action, and sophisticated control with maximal movement precision and speed. Meanwhile, material scientists have sought compounds and fabrication strategies to devise polymeric actuators that are small, soft, adaptive, and stimuli-responsive. Merging these two fields has given birth to a new class of devices—soft microrobots that, by combining concepts from microrobotics and stimuli-responsive materials research, provide several advantages in a miniature form: external, remotely controllable power supply, adaptive motion, and human-friendly interaction, with device design and action often inspired by biological systems. Herein, recent progress in soft microrobotics is highlighted based on light-responsive liquid-crystal elastomers and polymer networks, focusing on photomobile devices such as walkers, swimmers, and mechanical oscillators, which may ultimately lead to flying microrobots. Finally, self-regulated actuation is proposed as a new pathway toward fully autonomous, intelligent light robots of the future.
Metal Recovery from Industrial and Mining Wastewaters

Biological sulphate-reduction is a microbial-mediated process where sulphate is reduced to sulphide, which can be used to recover metals as sulphidic precipitates. To date, this technology has been assessed at full scale to recover valuable metals such as Cu, Ni and Zn. Despite this, research gaps are still encountered in this technology for improving and expanding its scope. Accordingly, the present review discusses: (1) the state of the art of the sulphate-reduction process, (2) the substrate options available that can meet the needs of the process, (3) the bioreactor configurations and their suitability for metal recovery, (4) the principles and factors affecting metal sulphide-precipitation and (5) the basis and advances on modelling and control of the process. The high diversity and versatility of sulphate-reducing bacteria allows exploring the use of substrates and operational conditions that facilitate the recovery of metals in bioreactors. Due to the lack of organics on industrial and mining waste streams that can sustain sulphate-reducing bacteria, the selection of a degradable, cost-effective, available, and non-pollutant substrate becomes crucial for the process. Different bioreactor configurations have been tested for the removal of metals from waste streams upon variations of the several operational conditions, concentration and type of metals tested, but metal recovery is hardly reported. Sulphate-reduction modelling has been developed to predict sulphide-inhibition/toxicity, microbial competition, kinetic parameters, biofilm and granulation development, sulphide-equilibrium and for scale-up design. Physicochemical reactions such as sorption/desorption and precipitation/solubilisation are not included in sulphate-reduction models despite that they are highly important for metal recovery in these systems. Sulphide and pH control in sulphate-reducing bioreactors is inherently essential to achieve metal recovery and to avoid unnecessary electron donor addition and over production of sulphide.

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Microbial community response on wastewater discharge in boreal lake sediments
Despite high performance, municipal wastewater treatment plants (WWTPs) still discharge significant amounts of organic material and nitrogen and even microbes into the receiving water bodies, altering physico-chemical conditions and microbial functions. In this study, we examined how nitrified wastewater affects the microbiology of boreal lake sediments. Microbial community compositions were assessed with next generation sequencing of the 16S rRNA gene, and a more detailed view on nitrogen transformation processes was gained with qPCR targeting on functional genes (nirS, nirK, nosZI, nosZII, amoAarchaea, and amoAbacteria). In both of the two studied lake sites, the microbial community composition differed significantly between control point and wastewater discharge point, and a gradual shift toward natural community composition was seen downstream following the wastewater gradient. SourceTracker analysis predicted that ~2% of sediment microbes were of WWTP-origin on the study site where wastewater was freely mixed with the lake water, while when wastewater was specially discharged to the sediment surface, ~6% of microbes originated from WWTP, but the wastewater-influenced area was more limited. In nitrogen transformation processes, the ratio between nitrifying archaea (AOA) and bacteria (AOB) was affected by wastewater effluent, as the AOA abundance decreased from the control point (AOA:AOB 28:1 in Keuruu, 11:1 in Petäjävesi) to the wastewater-influenced sampling points, where AOB dominated (AOA:AOB 1:2–1:15 in Keuruu, 1:3–1:19 in Petäjävesi). The study showed that wastewater can affect sediment microbial community through importing nutrients and organic material and altering habitat characteristics, but also through bringing wastewater-originated microbes to the sediment, and may thus have significant impact on the freshwater biogeochemistry, especially in the nutrient-poor boreal ecosystems.
Occurrence of photoinduced charge separation by the modulation of the electronic coupling between pyrene dimers and chemically converted graphenes

The photoexcitation of the pyrene dimer on graphene resulted in the final formation of a charge-separated state following an exciplex formation, while that of the pyrene monomer on graphene generated the corresponding exciplex solely due to the difference in the electronic coupling between the pyrene and the graphene.
Orientational optical nonlinearities in polymer-stabilized dye-doped liquid crystals

Dye-doped liquid crystals have drawn much attention for their potential in nonlinear optical applications. To invoke nonlinear optical effects, high light intensities are typically required. This review briefly introduces our group’s efforts on developing highly nonlinear, dye-doped LC systems. By (i) using an effective oligothiophene dye, (ii) introducing polymer stabilization of the LC host and (iii) using hybrid molecular alignment, we have achieved self-focusing, a common third-order nonlinear process, even using a low-power, handheld laser-pointer.
Photoinduced Electron Transfer in 9-Substituted 10-Methylacridinium Ions

A series of 9-substituted 10-methylacridinium ions (Acr+-R) in which an electron-donor moiety (R) is directly linked with an electron-acceptor moiety (Acr+) at the 9-position was synthesized, and the photodynamics was fully investigated to determine the rate constants of photoinduced electron transfer (ET) and back electron transfer. The driving forces of photoinduced electron transfer and back electron transfer were determined by means of electrochemical and photophysical measurements. The dependence of the ET rate constants on driving force was well analyzed in the light of the Marcus theory of ET. The quantum yields of formation of the triplet ET states vary significantly, depending on the interaction between the donor (R) and acceptor (Acr+) moieties. Among the Acr+-R examined, the 9-mesityl-10-methylacridinium ion (Acr+-Mes) exhibits the best performance in terms of the lifetime of the triplet ET state and the quantum yield. Photoexcitation of Acr+-Mes results in formation of the triplet ET state [3(Acr.-Mes.+)], which has a long lifetime, a high energy (2.37 eV), and a high quantum yield (>75 %) in acetonitrile. The triplet ET state exhibits both the oxidizing and reducing activity of the Mes.+ and Acr. moieties, respectively.
Photophysical properties of porphyrin dimer-single-walled carbon nanotube linked systems

Porphyrin dimers were covalently grafted onto electron-accepting single-walled carbon nanotube (SWNT) sidewalls by direct aryl radical addition reaction with an m- or p-phenylene linker with the help of p-p interaction between the porphyrins. A splitting of the porphyrin Soret band and DFT calculations supported the selective formation of the porphyrin dimers on the sidewall of SWNTs. Photoexcitation of the porphyrin dimers on the SWNT resulted in the formation of the exciplex state, which directly decayed to the ground state without yielding the complete charge-separated state. Lifetimes of the porphyrin dimer-SWNT exciplex were longer than that of a porphyrin monomer-SWNT exciplex due to the stabilization by p-electron interaction over two porphyrin rings. In addition, the weaker electronic coupling through the meta-linkage than the para-one may be responsible for the exciplex lifetime of the porphyrin dimer-SWNT with the m-phenylene linker (49 ps) longer than that with the p-phenylene one (24 ps). The results obtained here provide the basic information on the effect of the donor dimerization on the photodynamic behavior of the exciplex state in donor-acceptor linked systems. [Figure presented]
and azobenzene derivatives containing an iodotetrafluoro-benzene ring as XB donor, where the iodide anion acted as an XB acceptor. DSC and X-ray diffraction analyses revealed that the preferred stoichiometry between the XB donors and acceptors is 2:1, and that the iodide anions act as bidentate XB-acceptors, binding two azobenzene derivatives. Due to the high directionality of the XB, calamitic superanions are obtained, while the segregation occurring between the charged and uncharged parts of the molecules gives rise to a layered structure in the crystal lattice. Despite the fact that the starting materials are non-mesomorphic, the halogen-bonded supramolecular complexes exhibited monotropic lamellar liquid-crystalline phases over broad temperature ranges, as confirmed with polarized optical microscopy. Due to the presence of the azobenzene moieties, the LCs were photoresponsive, and a LC-to-isotropic phase transition could be obtained by irradiation with UV light. We envisage that the light-induced phase transition, in combination with the ionic nature of the LC, provides a route towards light-induced control over ion transport and conductance in these supramolecular complexes.

Programming Photoresponse in Liquid Crystal Polymer Actuators with Laser Projector

A versatile, laser-projector-based method is demonstrated for programming alignment patterns into monolithic films of liquid crystal polymer networks. Complex images can be photopatterned into the polymer films with sub-100 μm resolution, using relatively short exposure times. The method is further used to devise both photochemically and photothermally driven actuators that can undergo distinct light-induced shape changes, dictated by the programmed alignment patterns. Deformation modes such as buckling and coiling, as well as miniature robotic devices such as a gripper and a light-responsive octopod, are demonstrated. The reported technique enables easy and cost-effective programmable actuation with relatively high throughput, thus significantly facilitating the design and realization of functional soft robotic actuators.
Release of Potassium during Devolatilization of Spruce Bark

The spruce bark with different particle sizes were devolatilized under various final temperatures and heating rates. The char yield and potassium release from the spruce bark at studied conditions were quantified. Lower char yields realized from the smaller fuel particles at high temperature and heating rate. It is mainly attributed to shorter residence time of volatiles in the fuel/char particles and less intensive secondary reaction of volatiles consequently. The devolatilization temperature has the most significant effects on alkali release from the studied spruce bark. At 600°C, less than 5% of alkali released from the both small and large particles regardless of heating rate. However, at 850°C, release of potassium from the small spruce bark particles sharply increased from 2.63% and 4.71% to 12.87% and 17.89%, as they were heated under heating rate of 50 K/min and 500 K/min, respectively. Large fraction of alkali released from studied fuel particles as they were devolatilized under a high heating rate. Additionally, more potassium release from small particles (125<d<180 µm) then the larger ones (500<d<600 µm) and this tendency increased with devolatilization temperature. In brief, intensive devolatilization conditions may limit secondary reactions of potassium containing compounds in the volatiles and thereby formation of more stable phases. The results obtained in the present work are of importance for understanding of potassium release during thermal conversion of spruce bark and proposing measures for mitigating potassium related operational problems.

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Shape change of biogenic elemental selenium nanomaterials from nanospheres to nanorods decreases their colloidal stability
Microbial reduction of selenium oxyanions under mesophilic (30 °C) and thermophilic (55 °C) conditions produces biogenic elemental selenium nanospheres (BioSe-Nanospheres) and nanorods (BioSe-Nanorods), respectively. While the properties of BioSe-Nanospheres are well studied, the colloidal properties of BioSe-Nanorods have not yet been investigated. Therefore, this study characterized the surface properties of BioSe-Nanorods, compared their colloidal properties with BioSe-Nanospheres and elucidated the formation of BioSe-Nanorods in the presence of a capping agent.
This study demonstrated that BioSe-Nanorods, like BioSe-Nanospheres, are capped by extracellular polymeric substances (EPS) as evidenced by infrared spectroscopy. The EPS capped BioSe-Nanorods were less colloidally stable than EPS capped BioSe-Nanospheres as demonstrated by the former's less negative zeta potential values when exposed to 10 mM NaCl. In fresh lake water, BioSe-Nanospheres showed a 91.6 (±0.5)% settling efficiency, while BioSe-Nanorods displayed a settling efficiency of 97.1 (±0.5)%. The lower colloidal stability and higher settling efficiency was due to a 7 times less negative surface charge of BioSe-Nanorods compared to BioSe-Nanospheres at pH 7.2. Further, this study observed that the formation of BioSe-Nanorods might proceed via BioSe-Nanospheres through orientation attachment followed by anisotropic growth as well as a solid-solution-solid mechanism. This study demonstrates the importance of the shape of nanoparticles in determining their bioremediation effectiveness and fate in the environment.

**Structural and Photophysical Properties of Pentacene Alkanethiolate Monolayer-Protected Gold Nanoclusters and Nanorods: Supramolecular Intercalation and Photoinduced Electron Transfer with C60**

6,13-Bis(trisopropylsilylthynyl)-pentacene (TIPS-pentacene: TP) alkanethiolate monolayer-protected gold nanoclusters (TP-Cn-X-MPCs: X stands for small (S) and large (L) nanocluster sizes) and nanorods (TP-Cn-MPRs) with different alkyl chain lengths (n = 7, 11) were synthesized to examine the structural and photophysical properties as well as intercalation trends with C60. The syntheses of TP-Cn-X-MPCs and TP-Cn-MPRs were successfully performed using two different precursors: TP disulfides and TP alkanethiols. The detailed structural properties were confirmed by 1H NMR, elemental analyses, and transmission electron micrograph (TEM). In the spectroscopic absorption and fluorescence excitation measurements, spectral shapes of TP units on the gold surface were clearly observed, whereas fluorescence intensities of TP units were strongly quenched as compared to the corresponding reference monomer (TP-Ref). Then, fluorescence quenching titration experiments to determine the association constants (Kapp) between C60 and TP assemblies (TP-Cn-X-MPCs and TP-Cn-MPRs) were performed by adding C60 in toluene. The Kapp values were largely dependent on the sizes of nanoclusters and alkyl chain lengths in TP-Cn-X-MPC. For example, the Kapp value of TP-C7-S-MPC (73 800 M⁻¹) was much larger than those of TP-C11-S-MPC (37 800 M⁻¹) and TP-C7-L-MPC (5350 M⁻¹). This trend is in sharp contrast with the similar Kapp values (∼66 000 M⁻¹) in TP-Cn-MPR (n = 7, 11). These results suggest that the intercalation behaviors are dependent on the surface structures (nanocluster vs nanorod). Such fluorescence quenching processes by photoinduced electron transfer (PET) in the complex between TP-C7-S-MPC and C60 were directly observed by femtosecond transient absorption measurements, monitoring the TP radical cation and C60 radical anion.
Supramolecular control of liquid crystals by doping with halogen-bonding dyes

Introducing photochromic or polymeric dopants into nematic liquid crystals is a well-established method to create stimuli-responsive photonic materials with the ability to "control light with light". Herein, we demonstrate a new material design concept by showing that specific supramolecular interactions between the host liquid crystal and the guest dopants enhance the optical performance of the doped liquid crystals. By varying the type and strength of the dopant-host interaction, the phase-transition temperature, the order parameter of the guest molecules, and the diffraction signal in response to interference irradiation, can be accurately engineered. Our concept points out the potential of supramolecular interactions in liquid-crystal photonics, being valuable for optimizing the design of dye-doped functional liquid-crystalline systems.

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Surface-Relief Gratings in Halogen-Bonded Polymer–Azobenzene Complexes: A Concentration-Dependence Study

In recent years, supramolecular complexes comprising a poly(4-vinylpyridine) backbone and azobenzene-based halogen bond donors have emerged as a promising class of materials for the inscription of light-induced surface-relief gratings (SRGs). The studies up to date have focused on building supramolecular hierarchies, i.e., optimizing the polymer–azobenzene noncovalent interaction for efficient surface patterning. They have been conducted using systems with relatively low azobenzene content, and little is known about the concentration dependence of SRG formation in halogen-bonded polymer–azobenzene complexes. Herein, we bridge this gap, and study the concentration dependence of SRG formation using two halogen-bond-donating azobenzene derivatives, one functionalized with a tetrafluoroiodophenyl and the other with an iodoethynylphenyl group. Both have been previously identified as efficient molecules in driving the SRG formation. We cover a broad concentration range, starting from 10 mol % azobenzene content and going all the way up to equimolar degree of complexation. The complexes are studied as spin-coated thin films, and analyzed by optical microscopy, atomic force microscopy, and optical diffraction arising during the SRG formation. We obtained diffraction efficiencies as high as 35%, and modulation depths close to 400 nm, which are significantly higher than the values previously reported for halogen-bonded polymer–azobenzene complexes.

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Synthesis of new acylsilanes

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Synthesis of phenol-derivatives and biological screening for anticancer activity

Phenolic compounds are known for their cytotoxic properties against cancer cells despite their still unclear general mechanism of action. Herein is reported the evaluation of the cytotoxic effects of on human osteosarcoma cells of nine phenol derivatives against osteosarcoma cells, and some insights on their mechanism. The cytotoxicity was characterized by cell viability, scratch assay, cellular DNA content measurement, Annexin V apoptosis, mitochondrial calcium and caspase 3/7 assays. The study shows that out of the nine compounds used in this study, a tetrahydroquinoline derivative, 2-[(1,2,3,4-tetrahydroquinolin-1-yl)(4-methoxyphenyl)methyl]phenol, was found to exhibit strong inhibitory response with IC50 of 50.5 ± 3.8 μM, and therefore can be a potential chemotherapeutic agent. Further experiments revealed that this compound induces cell death by apoptosis and also act as a migration inhibitor. Analysis of the mitochondrial calcium following treatment with the compound on U2OS cells showed a significant reduction in the level of mitochondrial calcium concentration suggesting a mitochondrial calcium-dependent mechanism in triggering apoptosis. Treatment of HEK293 cells with the compound confirmed the cytotoxic effects of the compound, however, an increase in the level of mitochondrial calcium was observed. Moreover, the caspase 3/7 mediated cell death was also observed in both cell types. Overall, the study suggests that the derivatives of this compound can be used for development of new therapeutics for osteosarcoma and other cancers.

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The impact of long-term water level draw-down on microbial biomass: A comparative study from two peatland sites with different nutrient status

We examined the effects of long-term (51 years) drainage on peat microbial communities using phospholipid fatty acid (PLFA) analysis. We analysed the peat profiles of natural and adjacent drained fen and bog sites. Viable microbes (i.e. microbial PLFA) were present in relatively large amounts even in the deepest peat layers of both peatland sites, a finding that warrants further investigation. Microbial biomass was generally higher in the fen than in the bog. Microbial community structure (indexed from PLFA) differed between the fen and bog sites and among depths. Although we did not exclude other factors, the effect of drainage on the total microbial biomass and community structure was not limited to the surface layers, but extended to the deepest layers of the fen and bog. Long-term drainage increased the total microbial PLFA biomass in the surface, subsurface and bottom layers of the fen, but decreased it in the surface and bottom layers of the bog site. Drainage also increased the characteristic FAs of Gram-positive and Gram-negative bacteria in the surface and subsurface layers of the fen, and decreased them in the bottom layers of the bog site. The characteristic fungal FA was only reduced in the surface layers of the bog site by drainage. Thus, by affecting the microbial community beyond the surface layers, long-term peatland water-level draw-down can alter the microbial contribution to deeper peat organic matter stabilization. This suggests that long-term drainage may have a more significant climate change effect than revealed by the surface layer analyses alone.
Vapor Phase Fabrication of Nanoheterostructures Based on ZnO for Photoelectrochemical Water Splitting

Nanoheterostructures based on metal oxide semiconductors have emerged as promising materials for the conversion of sunlight into chemical energy. In the present study, ZnO-based nanocomposites have been developed by a hybrid vapor phase route, consisting in the chemical vapor deposition of ZnO systems on fluorine-doped tin oxide substrates, followed by the functionalization with Fe₂O₃ or WO₃ via radio frequency-sputtering. The target systems are subjected to thermal treatment in air both prior and after sputtering, and their properties, including structure, chemical composition, morphology, and optical absorption, are investigated by a variety of characterization methods. The obtained results evidence the formation of highly porous ZnO nanocrystal arrays, conformally covered by an ultrathin Fe₂O₃ or WO₃ overlayer. Photocurrent density measurements for solar-triggered water splitting reveal in both cases a performance improvement with respect to the bare zinc oxide, that is mainly traced back to an enhanced separation of photogenerated charge carriers thanks to the intimate contact between the two oxides. This achievement can be regarded as a valuable result in view of future optimization of similar nanoheterostructured photoanodes.
A comparison of fate and toxicity of selenite, biogenically and chemically synthesized selenium nanoparticles to zebrafish (Danio rerio) embryogenesis

Microbial reduction of selenium (Se) oxyanions to elemental Se is a promising technology for bioremediation and treatment of Se wastewaters. But a fraction of biogenic nano-Selenium (nano-Se(b)) formed in bioreactors remains suspended in the treated waters, thus entering the aquatic environment. The present study investigated the toxicity of nano-Se(b) formed by anaerobic granular sludge biofilms on zebrafish embryos in comparison with selenite and chemogenic nano-Se (nano-Se(c)). The nano-Se(b) formed by granular sludge biofilms showed a LC50 value of 1.77 mg/L, which was 3.2-fold less toxic to zebrafish embryos than selenite (LC50 = 0.55 mg/L) and 10-fold less toxic than bovine serum albumin stabilized nano-Se(c) (LC50 = 0.16 mg/L). Smaller (nano-Se(cs); particle diameter range: 25-80 nm) and larger (nano-Se(cl); particle diameter range: 50-250 nm) sized chemically synthesized nano-Se(c) particles showed comparable toxicity on zebrafish embryos. The lower toxicity of nano-Se(b) in comparison to nano-Se(c) was analyzed in terms of the stabilizing organic layer. The results confirmed that the organic layer extracted from the nano-Se(b) consisted of components of the extracellular polymeric substances (EPS) matrix, which govern the physiochemical stability and surface properties like ζ-potential of nano-Se(b). Based on the data, it is contended that the presence of humic acid like substances of EPS on the surface of nano-Se(b) plays a major role in lowering the bioavailability (uptake) and toxicity of nano-Se(b) by decreasing the interactions between nanoparticles and embryos.

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Controlling the shape of Janus nanostructures through supramolecular modification of ABC terpolymer bulk morphologies
Abstract Block copolymers microphase separate into a variety of bulk morphologies that serve as scaffolds, templates, masks and source for polymeric nano-particles. While supramolecular additives are common to complex within diblock copolymers to modify the morphology, the subtle effects of complexation on ABC triblock terpolymer morphologies are less explored. Here, we describe the manipulation of polystyrene-block-poly(4-vinylpyridine)-block-poly(tert-butyl methacrylate) (PS-b-P4VP-b-PT or S4VT) triblock terpolymer bulk morphologies through supramolecular complexation with rod-like 4-(4-pentylphenylazo)phenol (5PAP). The 5PAP molecule hydrogen bonds by phenolic groups to the 4VP repeating units and with increasing molar fraction of 5PAP, initially observed P4VP cylinders flatten into elliptic cylinders until a morphological transition occurs into a third (P4VP/5PAP) lamella. At sufficient 5PAP loadings, the cylinders can even merge into a perforated P4VP lamella located at the PS/PT interface. Quaternization of the P4VP phase and re-
dispersion in organic solvent allows liberating S4VT Janus nanostructures from the bulk, including Janus cylinders, nanoporous Janus membranes and Janus sheets. The manipulation of "sandwiched" microphases through supramolecular binding motifs could allow the preparation of previously inaccessible terpolymer bulk morphologies and, in case of cross-linkable phases, lead to a larger library of Janus nano-objects.

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**Influence of torrefaction pretreatment on the pyrolysis of Eucalyptus clone: A study on kinetics, reaction mechanism and heat flow**

The adverse nature of biomass requires specific pretreatment processes to better utilize it in bioenergy applications, and torrefaction is one of the most recognized thermal pretreatment methods. In this regard, we studied the effect of torrefaction pretreatment on kinetics, reaction mechanism and heat flow during the pyrolysis of biomass by making a comparative analysis between the pyrolysis of dried and torrefied Eucalyptus wood. Torrefied biomass was produced at three temperatures, namely 250, 275 and 300 °C. Pyrolysis was performed at 700 °C. The char yield during pyrolysis increased from 22.39 percent to 36.34 percent when the torrefaction temperature was increased from 250 to 300 °C. The reported activation energy values for dried biomass were within the range of 165–185 kJ/mol, and for the biomass torrefied at 300 °C they were within the range of 180–245 kJ/mol. We used two different approaches, namely master plots and kinetic compensation parameters, to identify the reaction mechanism. The results showed that torrefaction treatment had an effect on the reaction mechanism of the biomass pyrolysis. The reason could be the degradation of hemicellulose during torrefaction, and thereby the formation of smaller molecules during the pyrolysis of torrefied biomass. The heat flow data from differential scanning calorimetry (DSC) showed that pyrolysis started with exothermic reactions for dried samples, and endothermic reactions for torrefied samples. The results presented provide valuable insights into increasing the
understanding of the pyrolysis of torrefied biomass.

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**Remarkable Dependence of Exciplex Decay Rate on Through-Space Separation Distance Between Porphyrin and Chemically Converted Graphene**
A series of chemically converted graphenes (CCGs) covalently functionalized with multiple zincporphyrins (ZnPs) through tuned lengths of linear oligo-p-phenylene bridges (ZnP-phn-CCG, n = 1–5) were prepared to address the bridge length effect on their photodynamics. Irrespective of the bridge length, photoexcitation of ZnP-phn-CCG led to exclusive formation of an exciplex state, which rapidly decayed to the ground state without yielding the completely charge-separated state. The notable dependence of the exciplex lifetime as a function of separation distance between the porphyrin and CCG has been observed for the first time, supporting the hypothesis that the decay to the ground state is dominated by the through-space interaction rather than the through-bond one. The basic information on the interaction between ZnP and CCG in the excited state will provide us with deeper insight on the intrinsic nature of the exciplex state as a function of donor–acceptor interaction.

**General information**
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The effect of low-temperature pretreatment on the solubilization and biomethane potential of microalgae biomass grown in synthetic and wastewater media

Microalgae have been suggested as a sustainable raw material for biofuel production in the form of methane via anaerobic digestion. Here, pretreatments at 60–80 °C were investigated, aiming to study the impact of algae culture media on biomethane potential and pretreatment efficiency. Chlorella vulgaris and mixed culture of native algae species (dominating by Scenedesmus sp.) were grown in synthetic medium, wastewater (sterilized and non-sterilized) and digestate from anaerobic digestion of pulp and paper biosludge (sterilized and non-sterilized). The biomethane potential for native microalgal biomass varied between 154 and 252 L CH₄ kg⁻¹ VS depending on culture media. The efficiency of the low-temperature pretreatment (80 °C, 3 h) for solubilization (9–12%) of C. vulgaris and native algae biomass was similar for algae grown in sterilized and non-sterilized wastewater media. The pretreatment increased the biomethane potential of native algae biomass by 11–24%.

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Anaerobic digestion of microalgae and pulp and paper biosludge

In recent decades, microalgae have attracted attention as a promising biomass source for a variety of different biofuels, including methane via anaerobic digestion (AD). However, the energy intensity and cost (e.g., for the nutrient supply) of the process chain mean that breakthroughs in algal biofuels have yet to be realized. The objective of this study was to improve the AD of wastewater-grown microalgal biomass, marine algal residues following lipid extraction for renewable diesel production and to improve the AD of pulp and paper industry biosludge. The digestate from the latter substrate could provide nutrients for algae cultivation and lipid extraction followed by AD offers the possibility of obtaining multiple products from algal biomass, as envisaged by the algal biorefinery concept.

Based on the results of this experimental work, pretreatments and novel reactor designs can be used to improve the AD of microalgae. In this study, BMPs for wastewater- and digestate-grown mixed populations of microalgae varied between 154 and 273 L CH4 kg⁻¹ volatile solids (VS). Low-temperature (3 h, 80°C) pretreatments enhanced the BMPs by 11–27%. However, to ensure positive energy balances, the availability of waste heat was necessary. Due to longer solid retention times, the AD of microalgae in unmixed, accumulating-volume reactors (AVRs) at 16–21°C was more feasible than AD in conventional completely stirred tank reactors (CSTRs) at 35°C when the solid concentration of the algal biomass was low (<4% total solids [TSs]). Biological (at ~60°C) and freeze-thaw pretreatments enhanced the methane yield (32–50% increase) and the mineralization of nitrogen and phosphorus (41–84% increase) in the low-temperature AVRs.

In the present study, the AD of marine algae residue after lipids were extracted for renewable diesel production was demonstrated and the salt concentration of the marine algal biomass did not affect AD. Thermophilic AD in the CSTR resulted in a 48% higher methane yield (220 L CH4 kg⁻¹ VSs) of algal residues compared with mesophilic AD. However, unlike mesophilic AD, ammonia, which originated from the high nitrogen content of the algal biomass, inhibited the thermophilic process.

AD of pulp and paper industry biosludge mineralized nutrients to a soluble form, making effluent a potential media for algal cultivation. The methane yield from the biosludge was low (78 L CH4 kg⁻¹ VS) but increased by 77% with thermal pretreatment (20 min, 121°C). The pretreatment also resulted in AD with a retention time of 10 d, as compared to 14 d for untreated biosludge. However, the energy balance of the pretreatment was dependent on the solid concentration and temperature of the biosludge from the industrial process.

To conclude, this work demonstrated AD of microalgae under psychrophilic, mesophilic, and thermophilic conditions. The low energy balances emphasize that improvements in algae cultivation are required and/or other benefits (e.g., nutrient recovery, value-added products, and waste treatment) obtained for algal AD to become a full-scale application.

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Publication information
The Orange Side of Disperse Red 1: Humidity-Driven Color Switching in Supramolecular Azo-Polymer Materials Based on Reversible Dye Aggregation

Humidity detection, and the quest for low-cost facile humidity-sensitive indicator materials is of great interest for many fields, including semi-conductor processing, food transport and storage, and pharmaceuticals. Ideal humidity-detection materials for these applications might be based on simple clear optical readout with no power supply, i.e.: a clear color change observed by the naked eye of any untrained observer, since it doesn't require any extra instrumentation or interpretation. Here, the introduction of a synthesis-free one-step procedure, based on physical mixing of easily available commercial materials, for producing a humidity memory material which can be easily painted onto a wide variety of surfaces and undergoes a remarkable color change (approximately 100 nm blue-shift of λMAX ) upon exposure to various thresholds of levels of ambient humidity is reported. This strong color change, easily visible to as a red-to-orange color switch, is locked in until inspection, but can then be restored reversibly if desired, after moderate heating. By taking advantage of spontaneously-forming reversible 'soft' supramolecular bonds between a red-colored azo dye and a host polymer matrix, a reversible dye 'migration' aggregation appearing orange, and dis-aggregation back to red can be achieved, to function as the sensor.
Anaerobic batch conversion of pine wood torrefaction condensate

Organic compound rich torrefaction condensate, owing to their high water content and acidic nature, have yet to be exploited for practical application. In this study, microbial conversion of torrefaction condensate from pine wood through anaerobic batch digestion (AD) to produce methane was evaluated. Torrefaction condensate exhibited high methane potentials in the range of 430-492mL/g volatile solids (VS) and 430-460mL/gVS under mesophilic and thermophilic conditions, respectively. Owing to the changes in the composition, the methane yields differed with the torrefaction condensates produced at different temperatures (225, 275 and 300°C), with a maximum of 492±18mL/gVS with the condensate produced at 300°C under mesophilic condition. The cyclic batch AD experiments showed that 0.1VSsubstrate:VSinoculum is optimum, whereas the higher substrate loading (0.2-0.5) resulted in a reversible inhibition of the methane production. The results suggest that torrefaction condensate could be practically valorized through AD.
Efficient Light-Induced Phase Transitions in Halogen-Bonded Liquid Crystals

Here, we present a new family of light-responsive, fluorinated supramolecular liquid crystals (LCs) showing efficient and reversible light-induced LC-to-isotropic phase transitions. Our materials design is based on fluorinated azobenzenes, where the fluorination serves to strengthen the noncovalent interaction with bond-accepting stilbazole molecules, and increase the lifetime of the cis-form of the azobenzene units. The halogen-bonded LCs were characterized by means of X-ray diffraction, hot-stage polarized optical microscopy, and differential scanning calorimetry. Simultaneous analysis of light-induced changes in birefringence, absorption, and optical scattering allowed us to estimate that <4% of the mesogenic units in the cis-form suffices to trigger the full LC-to-isotropic phase transition. We also report a light-induced and reversible crystal-to-isotropic phase transition, which has not been previously observed in supramolecular complexes. In addition to fundamental understanding of light-responsive supramolecular complexes, we foresee this study to be important in the development of bistable photonic devices and supramolecular actuators.

High Water-Splitting Efficiency through Intentional In and Sn Codoping in Hematite Photoanodes

The effects of intermittent thin ITO layers on the water-splitting efficiency of α-Fe2O3 films grown by PECVD on FTO substrates are reported. The α-Fe2O3 was codoped with indium and tin by temperature-driven ionic transport and
diffusion from the ultrathin ITO layer sputtered between the α-Fe2O3 layer and FTO substrate. The α-Fe2O3/ITO/FTO photoanodes showed a remarkable interdependence between the thickness of the ITO layer and PEC efficiency. Hematite photoanodes with a 32 nm thick ITO underlayer showed the highest photocurrent density of 2.5 mA cm−2, corresponding to an approximate 3-fold enhancement over pristine α-Fe2O3 at 1.23 V vs RHE, whereas the thinner (8 nm) ITO underlayer yielded the lowest onset potential at 0.6 V vs RHE. Although the electrode with a thicker 72 nm ITO underlayer showed a higher onset potential of 0.9 V vs RHE, it still showed an enhancement in the photocurrent density at higher bias voltages. α-Fe2O3 was also deposited on metallic titanium substrates with intermittent sputtered tin and ITO layers. The codoping with indium and tin from ITO was observed to yield greatly enhanced performance when compared with both α-Fe2O3 alone and tin-doped α-Fe2O3. Transient absorption decays in the sub-nanosecond time scale were not affected by the doping, indicating that the doping had little effect on the primary charge carrier generation and recombination. On the other hand, fewer trapped electrons on the microsecond to millisecond time scale and a greatly increased amount of long-lived surface photoholes were observed for the ITO-doped samples. The transient absorption results imply that the large increases in photoelectrochemical efficiency were obtained due to higher electron mobility, which reduces recombination and leads to more efficient electron extraction from the electrodes.

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Periodic Surface Structures Induced by a Single Laser Beam Irradiation
Methods for inscribing periodic surface patterns by light, especially those characterized by the ability to control the pattern dimensions, are continuously sought for. In this paper, a periodic pattern, which is called the willow structure, is written to a supramolecular polymer-azobenzene complex using a single coherent laser beam of linear polarization. The willow structure can be an alternative to the commonly used surface relief grating written with an interference pattern once it is known how to manipulate its period. It is shown that the periodicity of the structure obtained with the one-beam approach can be controlled by changing the thickness of the polymer layer and the inscription temperature, in addition to the wavelength of the inscribing light. This information is useful for the utilization of the single-beam method as a way for obtaining periodic structures with desired dimensions.

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Authors: Noga, J., Sobolewska, A., Bartkiewicz, S., Virkki, M., Priimägi, A.
Magnesium aminoclay enhances lipid production of mixotrophic Chlorella sp. KR-1 while reducing bacterial populations

Improving lipid productivity and preventing overgrowth of contaminating bacteria are critical issues relevant to the commercialization of the mixotrophic microalgal cultivation process. In this paper, we report the use of magnesium aminoclay (MgAC) nanoparticles for enhanced lipid production from oleaginous Chlorella sp. KR-1 with simultaneous control of KR-1-associated bacterial growth in mixotrophic cultures with glucose as the model substrate. Addition of 0.01–0.1 g/L MgAC promoted microalgal biomass production better than the MgAC-less control, via differential biocidal effects on microalgal and bacterial cells (the latter being more sensitive to MgAC's bio-toxicity than the former). The inhibition effect of MgAC on co-existing bacteria was, as based on density-gradient-gel-electrophoresis (DGGE) analysis, largely dosage-dependent and species-specific. MgAC also, by inducing an oxidative stress environment, increased both the cell size and lipid content of KR-1, resulting in a considerable, ∼25% improvement of mixotrophic algal lipid productivity (to ∼410 mg FAME/L/d) compared with the untreated control.
Mild pressure induces rapid accumulation of neutral lipid (triacylglycerol) in Chlorella spp.

Effective enhancement of neutral lipid (especially triacylglycerol, TAG) content in microalgae is an important issue for commercialization of microalgal biorefineries. Pressure is a key physical factor affecting the morphological, physiological, and biochemical behaviors of organisms. In this paper, we report a new stress-based method for induction of TAG accumulation in microalgae (specifically, Chlorella sp. KR-1 and Ch. sp. AG20150) by very-short-duration application of mild pressure. Pressure treatments of 10–15 bar for 2 h resulted in a considerable, ∼55% improvement of the 10–100 g/L cells' TAG contents compared with the untreated control. The post-pressure-treatment increase of cytoplasmic TAG granules was further confirmed by transmission electron microscopy (TEM). Notwithstanding the increased TAG content, the total lipid content was not changed by pressurization, implying that pressure stress possibly induces rapid remodeling/transformation of algal lipids rather than de novo biosynthesis of TAG.

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Scopus rating (2012): SJR 2.389 SNIP 2.465 CiteScore 5.25
Scopus rating (2011): SJR 2.314 SNIP 2.508 CiteScore 5.56
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Scopus rating (2006): SJR 1.315 SNIP 1.98
Scopus rating (2005): SJR 1.269 SNIP 2.006
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Scopus rating (2003): SJR 0.948 SNIP 1.639
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An effective strategy for environmentally sound biological recovery of copper and gold from discarded printed circuit boards (PCB) in a two-step bioleaching process was experimented. In the first step, chemolithotrophic acidophilic Acidithiobacillus ferrivorans and Acidithiobacillus thiooxidans were used. In the second step, cyanide-producing heterotrophic Pseudomonas fluorescens and Pseudomonas putida were used. Results showed that at a 1% pulp density (10 g/L PCB concentration), 98.4% of the copper was bioleached by a mixture of A. ferrivorans and A. thiooxidans at pH 1.0-1.6 and ambient temperature (23 ± 2 °C) in 7 days. A pure culture of P. putida (strain WCS361) produced 21.5 (±1.5) mg/L cyanide with 10 g/L glycine as the substrate. This gold complexing agent was used in the subsequent bioleaching step using the Cu-leached (by A. ferrivorans and A. thiooxidans) PCB material, 44.0% of the gold was mobilized in alkaline conditions at pH 7.3-8.6, and 30 °C in 2 days. This study provided a proof-of-concept of a two-step approach in metal bioleaching from PCB, by bacterially produced lixiviants.
Recombinant antibodies for specific detection of clostridial [Fe-Fe] hydrogenases

Biological hydrogen production is based on activity of specific enzymes called hydrogenases. Hydrogenases are oxygen sensitive metalloenzymes containing Ni and/or Fe atoms at the active site, catalyzing reversible reduction of protons. Generally, [Fe-Fe] hydrogenases prefer proton reduction to molecular hydrogen, a potential energy carrier molecule that can be produced by bioprocesses in sustainable manner. Thus, monitoring tools have been developed to study the relationship between [Fe-Fe] hydrogenases and biohydrogen production in bioreactors at DNA and RNA levels. In the present study, novel molecular tools are introduced for quantitative monitoring of clostridial [Fe-Fe] hydrogenases at the protein level. Aerobic and anaerobic biopanning (for inactive and active [Fe-Fe] hydrogenase, respectively) of phage displayed single-chain variable fragment (scFv) antibody libraries aided in isolating nine potential scFvs. The enriched antibodies demonstrated high specificity towards Clostridium spp. [Fe-Fe] hydrogenases allowing detection from pure and mixed cultures. Additionally, the antibodies showed different binding characteristics towards hydrogenase catalytic states, providing a possible means for functional detection of clostridial [Fe-Fe] hydrogenases. From hydrogenase-antibody interaction studies we observed that though antibody binding reduced the enzyme catalytic activity, it facilitated to retain hydrogen evolution from oxygen exposed hydrogenases.
Purpose: To investigate the effect of compression on the crystallization behavior in amorphous tablets using sum frequency generation (SFG) microscopy imaging and more established analytical methods. Method: Tablets containing neat amorphous griseofulvin with/without excipients (silica, hydroxypropyl methylcellulose acetate succinate (HPMCAS), microcrystalline cellulose (MCC) and polyethylene glycol (PEG)) were prepared. They were analyzed upon preparation and storage using attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy, scanning electron microscopy (SEM) and SFG microscopy. Results: Compression-induced crystallization occurred predominantly on the surface of the neat amorphous griseofulvin tablets, with minimal crystallinity being detected in the core of the tablets. The presence of various types of excipients was not able to mitigate the compression-induced surface crystallization of the amorphous griseofulvin tablets. However, the excipients affected the crystallization rate of amorphous griseofulvin in the core of the tablet upon compression and storage. Conclusions: SFG microscopy can be used in combination with ATR-FTIR spectroscopy and SEM to understand the crystallization behaviour of amorphous tablets upon compression and storage. When selecting excipients for amorphous formulations, it is important to consider the effect of the excipients on the physical stability of the amorphous formulations.

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Scopus rating (2012): SJR 1.882 SNIP 1.547 CiteScore 5.07
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Scopus rating (2003): SJR 1.155 SNIP 1.284
Scopus rating (2002): SJR 1.014 SNIP 1.206
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Elimination of arsenic-containing emissions from gasification of chromated copper arsenate wood
The behavior of arsenic in chromated copper arsenate containing wood during gasification was modeled using thermodynamic equilibrium calculations. The results of the model were validated using bench-scale gasification tests. It is shown that over 99.6% of arsenic can be removed from the product gas by a hot filter when the gas is cooled below the predicted condensation temperature.
Impacts of sulfur source and temperature on sulfur-driven denitrification by pure and mixed cultures of Thiobacillus

This study investigated the impacts of thiosulfate (S\textsubscript{2}O\textsubscript{3}\textsuperscript{2−}) as well as chemically synthesized and biogenic elemental sulfur (S\textsubscript{0}) on the rates of sulfur-based denitrification in batch bioassays. The use of S\textsubscript{2}O\textsubscript{3}\textsuperscript{2−} resulted in the highest denitrification rate (52.5 mg N-NO\textsubscript{3}−/L d), whereas up to 10 times slower nitrate (NO\textsubscript{3}−) removal was observed with S\textsubscript{0}. Biogenic S\textsubscript{0} was tested for the first time as electron donor for chemolithotrophic denitrification, resulting in 1.7-fold faster NO\textsubscript{3}− removal than that achieved with chemically synthesized S\textsubscript{0}. The effects of increasing concentrations of S\textsubscript{2}O\textsubscript{3}\textsuperscript{2−} and chemically synthesized S\textsubscript{0} on denitrification were evaluated testing three different sulfur-to-nitrogen (S/N) molar ratios (1.8, 3.5 and 5.1) on a pure culture of Thiobacillus denitrificans and a mixotrophic enrichment dominated by Thiobacillus thioparus. S\textsubscript{2}O\textsubscript{3}\textsuperscript{2−} concentrations exceeding 2.2 g/L inhibited the activity of T. denitrificans, whereas a stimulatory effect was observed on mixotrophic denitrification. The increase in S\textsubscript{0} concentration slightly enhanced denitrification by both microbial cultures due to the low solubility of chemically synthesized S\textsubscript{0}. The temperature dependence of the thiosulfate-driven denitrification by T. denitrificans was investigated to further optimize the process and modeled by the Arrhenius equation with an apparent activation energy Ea of 76.6 kJ/mol and a temperature coefficient Q\textsubscript{10} of 3.0.
Fossil Feedstock-free Preparation of Hydroquinone

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Research output: Scientific > Paper, poster or abstract

Utilization of Food Waste via Anaerobic Digestion: From Feedstock to Biogas and Fertilizers

Food waste is a renewable resource that can be utilized as both energy and nutrients through anaerobic digestion to increase nutrient recycling and fertilizer self-sufficiency and promote the mitigation of greenhouse gas emissions. Anaerobic digestion of food wastes has, however, faced challenges due to the waste’s characteristics, e.g., high protein content, which is why the organic loading rates with food waste digestion are usually kept low to achieve a stable process. The digestate produced during digestion contains all of the nutrients from the food waste feedstock and can be used as a fertilizer in agriculture, where the availability of nutrients, the stability of organic matter, and biosecurity define its agronomic value. In this thesis, the aim was to analyze the potential of using anaerobic digestion for food waste utilization. The anaerobic digestion of food waste, feedstock pretreatment, and processing and utilization of the digestate for fertilizer...
This study shows the potential of food waste as feedstock for anaerobic digestion without dilution, with a total solids content of 20–25%. A high organic loading rate of 6 kgVS/m3d (VS, volatile solids) was achieved with methane yields 400–430 m3/kgVS in continuous food waste digestion while the optimum loading rate was 3 kgVS/m3d, yielding around 480 m3/kgVS of methane. Trace element supplementation enabled a stable long-term operation and gradual increase of loading rates without the accumulation of acids. The autoclave pretreatment (160°C and 6.2 bars) of the food waste affected the characteristics – and subsequently, the anaerobic digestion performance, where the formation of protein-based hardly biodegradable compounds led to a 10% lower methane yield during digestion, decreased hydrogen sulfide content in the biogas, and 50% decreased ammonium nitrogen concentration within the digestate. The decreased availability of proteins and hydrogen sulfide formation due to the pretreatment reduce the risk of ammonia inhibition during anaerobic digestion and enable easier biogas cleaning and security.

The food waste digestates shows potential as a nutrient source in crop fertilization independently and after post-treatment. The studied digestates were considered suitable for fertilizer use, as they showed good agronomic value in terms of nutrient content and usability, as well as biosecurity. Food waste digestates produced around 5 to 30% higher ryegrass yield compared with a mineral fertilizer in pot experiments, and the majority (50–70%) of the nitrogen and phosphorus were in the soluble and plantavailable forms. The integration of anaerobic digestion and digestate post-treatment technologies enabled the processing of the digestate liquid into concentrated nutrient products rich in nitrogen and potassium. With the combination different processing technologies such as evaporation, stripping, and reverse osmosis, nutrient products with optimal composition can be produced to correspond with the fertilizer demand. Overall, due to the high energy potential of the food waste, the integration of the anaerobic digestion with heat-demanding digestate liquid post-treatment processes (e.g., stripping and/or evaporation) was possible.

In conclusion, anaerobic digestion has high potential for the utilization of food waste, as food waste produces high methane yields in optimized conditions. The food waste digestate was also shown to be a suitable nutrient (especially nitrogen) source in crop fertilization independently and after posttreatment.

**Photoinduced hole transfer in QD–phthalocyanine hybrids**

A series of CdSe quantum dot (QD)–phthalocyanine (Pc) hybrids were synthesized and their photophysics was studied using steady state and time-resolved spectroscopic methods. Emission of QDs was progressively quenched upon increasing the concentration of Pc in the hybrids. A detailed transient absorption study of the hybrids revealed that the mechanism of quenching is charge separation, resulting in the formation of hybrids with negatively charged QDs and the Pc cation. Direct photo-excitation of Pc did not show any detectable interaction between the excited state of Pc and the QD to which it is attached. An explanation is proposed, based on the suggestion that the energy of the lowest unoccupied molecular orbital (LUMO) of Pc is lower than the lower edge of the QD conduction band, while the energy of the highest occupied molecular orbital (HOMO) of Pc is sufficiently higher than the high energy edge of the QD valence band (VB), thus permitting hole transfer from the QD VB to the Pc HOMO after photo-excitation of QDs.
Long-term stability of bioelectricity generation coupled with tetrathionate disproportionation

To prevent uncontrolled acidification of the environment, reduced inorganic sulfur compounds (RISCs) can be bioelectrochemically removed from water streams. The long-term stability of bioelectricity production from tetrathionate ($S_{4}O_{6}^{2-}$) was studied in highly acidic conditions (pH <2.5) in two-chamber fed-batch microbial fuel cells (MFCs). The maximum current density was improved from previously reported 80 mA m$^{-2}$ to 225 mA m$^{-2}$ by optimizing the external resistance. The observed reaction products of tetrathionate disproportionation were sulfate and elemental sulfur. In long-term run, stable electricity production was obtained for over 700 days with the average current density of 150 mA m$^{-2}$. The internal resistance of the MFC decreased over time and no biofouling was observed. This study shows that tetrathionate is an efficient substrate also for long-term bioelectricity production.
Selenium: environmental significance, pollution, and biological treatment technologies

Selenium is an essential trace element needed for all living organisms. Despite its essentiality, selenium is a potential toxic element to natural ecosystems due to its bioaccumulation potential. Though selenium is found naturally in the earth’s crust, especially in carbonate rocks and volcanic and sedimentary soils, about 40% of the selenium emissions to atmospheric and aquatic environments are caused by various industrial activities such as mining-related operations. In recent years, advances in water quality and pollution monitoring have shown that selenium is a contaminant of potential environmental concern. This has practical implications on industry to achieve the stringent selenium regulatory discharge limit of 5 μg Se L⁻¹ for selenium containing wastewaters set by the United States Environmental Protection Agency. Over the last few decades, various technologies have been developed for the treatment of selenium-containing wastewaters. Biological selenium reduction has emerged as the leading technology for removing selenium from wastewaters since it offers a cheaper alternative compared to physico-chemical treatments and is suitable for treating dilute and variable selenium-laden wastewaters. Moreover, biological treatment has the advantage of forming elemental selenium nanospheres which exhibit unique optical and spectral properties for various industrial applications, i.e. medical, electrical, and manufacturing processes. However, despite the advances in biotechnology employing selenium reduction, there are still several challenges, particularly in achieving stringent discharge limits, the long-term stability of biogenic selenium and predicting the fate of bioreduced selenium in the environment. This review highlights the significance of selenium in the environment, health, and industry and biotechnological advances made in the treatment of selenium contaminated wastewaters. The challenges and future perspectives are overviewed considering recent biotechnological advances in the management of these selenium-laden wastewaters.

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Vesi-insinöörit arvojen välittäjinä: Infrastruktuurien hallinta muodostaa kivijalan kestävälle tulevaisuudelle

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Higher Cd adsorption on biogenic elemental selenium nanoparticles

Cadmium (Cd) is a carcinogenic metal contaminating the environment and ending up in wastewaters. There is therefore a need for improved methods to remove Cd by adsorption. Biogenic elemental selenium nanoparticles have been shown to adsorb Zn, Cu and Hg, but these nanoparticles have not been tested for Cd removal. Here we studied the time-dependency and adsorption isotherm of Cd onto biogenic elemental selenium nanoparticles using batch adsorption experiments. We measured ζ-potential values to assess the stability of nanoparticles loaded with Cd. Results show that the maximum Cd adsorption capacity amounts to 176.8 mg of Cd adsorbed per g of biogenic elemental selenium nanoparticles. The ζ-potential of Cd-loaded nanoparticles became less negative from −32.7 to −11.7 mV when exposing nanoparticles to an initial Cd concentration of 92.7 mg L⁻¹. This is the first study that demonstrates the high Cd uptake capacity of biogenic elemental selenium nanoparticles, of 176.8 mg g⁻¹, when compared to that of traditional adsorbents such as carboxyl-functionalized activated carbon, of 13.5 mg g⁻¹. An additional benefit is the easy solid–liquid separation by gravity settling due to coagulation of Cd-loaded biogenic elemental selenium nanoparticles.

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Methodological approaches for fractionation and speciation to estimate trace element bioavailability in engineered anaerobic digestion ecosystems: An overview

Optimal supply of trace elements (TE) is a prerequisite for microbial growth and activity in anaerobic digestion (AD) bioprocesses. However, the required concentrations and ratios of essential TE for AD biotechnologies strongly depend on prevailing operating conditions as well as feedstock composition. Furthermore, TE in AD bioreactors undergo complex physicochemical reactions and may be present as free ions, complex bound or as precipitates depending on pH, or on the presence of sulfur compounds or organic macromolecules. To overcome TE deficiency, various commercial mineral products are typically applied to AD processes. The addition of heavy metals poses the risk of overdosing operating systems, which may be toxic to microbial consortia and ultimately the environment. Adequate supplementation, therefore, requires appropriate knowledge not only about the composition, but also on the speciation and bioavailability of TE.
However, very little is yet fully understood on this specific issue. Evaluations of TE typically only include the measurement of total TE concentrations but do not consider the chemical forms in which TE exist. Thus detailed information on bioavailability and potential toxicity cannot be provided. This review provides an overview of the state of the art in approaches to determine bioavailable TE in anaerobic bioprocesses, including sequential fractionation and speciation techniques. Critical aspects and considerations, including with respect to sampling and analytical procedures, as well as mathematical modeling, are examined. The approaches discussed in this review are based on our experiences and on previously published studies in the context of the "COST Action 1302: European Network on Ecological Roles of Trace Metals in Anaerobic Biotechnologies."
Structural photoactivation of a full-length bacterial phytochrome

Phytochromes are light sensor proteins found in plants, bacteria, and fungi. They function by converting a photon absorption event into a conformational signal that propagates from the chromophore through the entire protein. However, the structure of the photoactivated state and the conformational changes that lead to it are not known. We report time-resolved x-ray scattering of the full-length phytochrome from Deinococcus radiodurans on micro- and millisecond time scales. We identify a twist of the histidine kinase output domains with respect to the chromophore-binding domains as the dominant change between the photoactivated and resting states. The time-resolved data further show that the structural changes up to the microsecond time scales are small and localized in the chromophore-binding domains. The global structural change occurs within a few milliseconds, coinciding with the formation of the spectroscopic meta-Rc state. Our findings establish key elements of the signaling mechanism of full-length bacterial phytochromes.

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The red, purple and blue modifications of polymeric unsymmetrical hydroxyalkadiynyl-N-arylcarbamate derivatives in Langmuir-Schaefer films

Solid topochemical photopolymerization (STP) of Langmuir-Schaefer films of a new class of unsymmetrical diynes, containing N-arylcarbamate groups in the hydrophobic part and hydroxymethylene groups in the hydrophilic part of the molecules was examined. In addition, the monomeric Langmuir monolayer formation was studied by Brewster angle microscopy and the surface morphology of monomer and polymer films on solid substrates were studied by scanning electron microscopy and atomic force microscopy. Three phases of polydiacetylene (PDA) (red, purple and blue) were observed after UV-light polymerization of above-mentioned films of alcohol diacetylene (DA) derivatives. The substitution of MeO group in the aryl ring substituent by hydrogen atom and the variation of the methylene group number in the hydrophobic part from 5 to 6 changed significantly the result of STP: instead of blue phase PDA observed for diynes with MeO group, the red phase PDA was observed for DA with H-atom from the very beginning of diyne film UV irradiation. For two other diynilic N-arylcarbamates of identical chemical structures except of the substituents in the aryl ring of hydrophobic parts of the molecules, no changes in the efficiency of polymerization or the position and shape of absorption bands were observed. This indicated the formation of the purple phase PDA. For these molecules, the number of methylene groups in hydrophobic and hydrophilic parts of the molecules was 9 and 2, respectively.

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Characterization and Potential Use of Source-Separated Urine

Human urine is an abundant source of the main nutrients (N, P, and K), while in the modern age it may contain traces of pharmaceutical and hormonal compounds. In many parts of the world, urine is collected into sewers, mixed with other wastewaters and treated at centralized wastewater treatment plants. Recently, the source separation of urine has been considered as a way to promote nutrient recovery from households as concentrated streams which could promote its use as fertilizer. The presence of pharmaceuticals and estrogens in urine has raised questions regarding its safe agricultural use, thus leading to a need to monitor the presence of pharmaceutically active compounds in urine. As a minimum, six-month storage before agricultural use is recommended for urine for hygienic reasons. The objective of this thesis was to develop and facilitate the use of source-separated urine by making the characterization of urine easier and faster, to gain more understanding regarding pharmaceutical and estrogenic behavior during urine storage, and to evaluate the suitability of human urine in microalgal cultivations as a nutrient source.

An analytical liquid chromatographic method, which had the advantage of simultaneous analysis of eight pharmaceuticals in a short six-minute analysis time, was developed as no such method previously existed (Paper I). The method was validated, proven repeatable, and the obtained pharmaceutical recoveries were acceptable (81.6–109.2%). The limit of detection for the pharmaceuticals in urine was 39–1 610 µg/L. In addition, a previously developed bioluminescent yeast cell biosensor Saccharomyces cerevisiae (BMAEREluc/ERα) was applied on urine samples, as prior to this thesis no information was available on the use of yeast biosensor in estrogenic activity assessment from source-separated human urine (Paper II). The biosensor produced repeatable results in the estrogenic activity testing of fresh and stored human urine with the limit of detection corresponding to 0.28–35 µg/L of estrogens. To enhance the signal, incubation with β-glucuronidase enzyme was used. The biosensor gave a cumulative signal for estrogenic activity (estrogens and estrogen-like compounds), thus enabling the assessment of overall estrogenic activity during urine storage.
The method presented in Paper I was subsequently used in monitoring spiked pharmaceutical concentrations in urine during six-month storage (Paper III). Each pharmaceutical (three antivirals and four antibiotic compounds) was tested in laboratory storage both individually and in therapeutic groups, as well as in therapeutic groups either with feces or urease inhibitor amendment. During storage, the overall concentration reductions of <1% to >99% were detected, and in assays with amendments, concentrations reductions remained <50%, except for rifampicin (>99%). Four of the pharmaceuticals had reduced concentrations after a six-month storage, suggesting biological or chemical degradation and/or precipitation of the compounds.

Human urine was tested as nutrient source for biomass production from microalga Chlorella vulgaris (Paper IV). Biomass yield in diluted urine was comparable with growth in artificial growth medium and urine could be utilized up to 1:25-dilutions without inhibition to algal growth. The highest biomass production (0.6 g/L) was achieved in 1:100-diluted urine. C. vulgaris used 32.5–78.7% of N and 35.1–99.0% of P available in urine. At the beginning of cultivation, the majority of the biomass consisted of algal cells, while towards the end the share of living algal cells decreased, indicating accumulation of bacteria and algal cell debris.

In conclusion, the results obtained in this thesis indicated that the pharmaceutical concentrations did not reduce enough in order to safely use urine. The yeast biosensor demonstrated that during storage, the estrogenic activity changes most likely due to bacterial enzyme activity, but some activity is still present after five months. The urine is a viable nutrient source for microalgal biomass production, thus having potential for sustainable use and recycling of nutrients.

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Authors: Jaatinen, S.
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Structural characterization, spectroscopic, thermal, AC conductivity and dielectric properties and antimicrobial studies of (C₈H₁₂N)₂[SnCl₆]

A new inorganic-organic hybrid material produced from 2,6-dimethylanilinium cations and tin halide (SnCl₆)²⁻ has been synthesized and structurally determined by X-ray diffraction method. The title compound crystallizes in the monoclinic system, space group C2/m with a = 19.8772(4), b = 6.9879(1), c = 8.3001(2) Å, β = 98.487(2)° and V = 1140.26(4) Å³. The crystal structure is built up of sheets of (SnCl₆)²⁻ octahedral anions and 2,6-xylidinium cations. The optical band gap was calculated and found to be 4.11 eV. At high temperature this compound exhibits a structural phase transition at 338 K. This has been characterized by differential scanning calorimetric and dielectric studies. Measurements of AC conductivity as a function of frequency at different temperatures indicated the hopping conduction mechanism. The bioassay results showed that the structure exhibits significant antibacterial activity.

**General information**

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Authors: Mathlouthi, M., Valkonen, A., Rzaigui, M., Smirani, W.
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Liquid fertilizer products from anaerobic digestion of food waste: Mass, nutrient and energy balance of four digestate liquid treatment systems

This study compared four different digestate liquid treatment systems of a theoretical anaerobic digestion plant in order to facilitate the utilization of municipal food waste nutrients in agriculture. The mass, nutrient and energy balances of a theoretical plant digesting 60 kt/y of food waste were used to evaluate the feasibility of the treatments to concentrate nutrients into liquid fertilizer products. The studied technologies for digestate liquid treatment were ammonia stripping, ammonia stripping combined with reverse osmosis (RO), evaporation combined with RO, and stripping combined with both evaporation and RO. As a result, processing of digestate into concentrated fertilizer products consumed less than 10% of the produced energy from food wastes and was also sufficient for the heat-demanding digestate liquid treatments, evaporation and stripping. The digestate liquid treatment systems were considered as nitrogen and potassium concentration methods which were able to concentrate up to 67% of the feedstock nitrogen into transportable fertilizer products with low mass. Of the studied digestate systems evaporation combined with RO was evaluated as the most efficient nutrient recovery technology for the production of transportable fertilizer products due to the high concentration of nutrients and nutrient availability as well as low product mass and energy consumption. Overall, the selection of the treatment technology is dependent on the location of the anaerobic digestion plant relative to the agricultural land and the type of fertilizer products needed.
Structurally Controlled Dynamics in Azobenzene-Based Supramolecular Self-Assemblies in Solid State

Light-responsive supramolecular self-assemblies exhibit interplay between order and dynamics of the self-assembling motifs, through which the thermal isomerization rate of azobenzene chromophores can be tuned by orders of magnitude. By using supramolecular complexes of 4-(4-alkylphenylazo)phenols hydrogen-bonded to poly(4-vinylpyridine) as model systems, we demonstrate that the thermal isomerization rate of the hydroxyazobenzene derivatives increases 5700-fold when the material undergoes a transformation from a disordered, low-azobenzene-concentration state to a high-concentration state exhibiting lamellar, smectic-like self-assembly. Drastically smaller thermal isomerization rates are observed in disordered structures. This allows us to attribute the change to a combination of increased number density of the hydroxyazobenzenes inducing plasticization, and cooperativity created by the chromophore-chromophore interactions through self-assembled molecular order and alignment. Our results pinpoint the importance of molecular self-assembly and intermolecular interactions in modifying the dynamics in supramolecular complexes in a controlled manner. We foresee this to be important in light-controlled dynamic materials.

General information

State: Published
Organsiations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Aalto University
Authors: Poutanen, M., Ikkala, O., Priimägi, A.
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Peer-reviewed: Yes

Publication information

Journal: Macromolecules
Volume: 49
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ISSN (Print): 0024-9297
Ratings:
Indocyanine Green-Loaded Liposomes for Light-Triggered Drug Release

Light-triggered drug delivery systems enable site-specific and time-controlled drug release. In previous work, we have achieved this with liposomes containing gold nanoparticles in the aqueous core. Gold nanoparticles absorb near-infrared light and release the energy as heat that increases the permeability of the liposomal bilayer, thus releasing the contents of the liposome. In this work, we replaced the gold nanoparticles with the clinically approved imaging agent indocyanine green (ICG). The ICG liposomes were stable at storage conditions (4-22 °C) and at body temperature, and fast near-infrared (IR) light-triggered drug release was achieved with optimized phospholipid composition and a 1:50 ICG-to-lipid molar ratio. Encapsulated small molecular calcein and FITC-dextran (up to 20 kDa) were completely released from the liposomes after light exposure for 15 s. Location of ICG in the PEG layer of the liposomes was simulated with molecular dynamics. ICG has important benefits as a light-triggering agent in liposomes: fast content release, improved stability, improved possibility of liposomal size control, regulatory approval to use in humans, and the possibility of imaging the in vivo location of the liposomes based on the fluorescence of ICG. Near-infrared light used as a triggering mechanism has good tissue penetration and safety. Thus, ICG liposomes are an attractive option for light-controlled and efficient delivery of small and large drug molecules.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Department of Chemistry and Bioengineering
Authors: Lajunen, T., Kontturi, L., Viitala, L., Manna, M., Cramariuc, O., Rög, T., Bunker, A., Laaksonen, T., Viitala, T., Murtomäki, L., Urtti, A.
Number of pages: 13
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ISSN (Print): 1543-8384
Ratings:
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Scopus rating (2015): SJR 1.611 SNIP 1.23 CiteScore 4.88
Photoactive ZnO-Organic Nanostructures: Development and Characterization

Photoinduced processes in hybrid semiconductor-organic nanostructures were studied in this thesis. The work was divided into three tasks: (1) preparation of ZnO thin films and nanorod arrays in a controlled and cost-effective way, (2) functionalization of the ZnO surfaces with organic, photoactive layers and (3) study of photoinduced reactions on the surfaces by both steady state and time-resolved methods. Aluminum doped zinc oxide (AZO) electrodes were tested as an alternative for the traditionally used indium tin oxide semitransparent electrodes in organic solar cell devices. The electrodes were prepared by atomic layer deposition method. Devices with AZO electrodes showed performance comparable to that of the reference device but were more stable in open air showing no degradation during 40 days time interval. ZnO nanorod arrays were prepared and used as model substrates to study electronic interactions at semiconductor-organic interface. The growth was optimized to achieve well-aligned nanorods with high specific surface area. To control the semiconductor electronic properties, while keeping the morphology unchanged, the nanorods were further modified with thin layers of Al2O3 or TiO2 prepared by atomic layer deposition. Self-assembled monolayers (SAM) of three different porphyrin derivatives and one phthalocyanine derivative were formed on the ZnO nanorods using carboxylic acid or siloxane as anchor groups. The fastest electron transfer from zinc porphyrin (ZnP) to the semiconductor was observed for the ZnO nanorods modified with a 5 nm layer of TiO2 (<0.2 ps). On the contrary, the charge recombination was not any faster compared to that of ZnP on the unmodified nanorods. This indicates that the charge recombination depends mainly on the semiconductor bulk properties, whereas the charge separation is determined by the surface properties of the semiconductor. The charge generation mechanisms in the hybrid systems consisting of zinc phthalocyanine (ZnPc) SAM on ZnO nanorods covered by a spin coated layer of hole transporting materials, P3HT or Spiro-OMeTAD, were studied with time-resolved absorption spectroscopy. After selective excitation of ZnPc the primary electron transfer step was controlled by the hole transporting material. In the system with P3HT the first reaction step is a fast (1.8 ps) electron transfer to ZnO, whereas in the Spiro-OMeTAD system a fast (0.5 ps) hole transfer from the excited ZnPc to Spiro-OMeTAD is the dominant primary electron transfer step. However, in both cases long-lived (> 5 ns) charge-separated states are formed. In these states electrons are localized in ZnO and the holes in the organic donor layer, while ZnPc is in the ground state.

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Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Hakola, H.
Number of pages: 60
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Original language: English

Publication series
Name: Tampere University of Technology. Publication
Volume: 1385
ISSN (Print): 1459-2045
Electronic structure of p-type perylene monoimide-based donor–acceptor dyes on the nickel oxide (100) surface: a DFT approach

A p-type dye-sensitized solar cell, where the dye injects a hole to the semiconductor, could be combined with typical Grätzel cell to create an efficient tandem device. However, the current p-type devices suffer from low efficiency. Here, geometries and electronic structures of four perylenemonoimide-based dyes (1–4) both as free and adsorbed on the NiO (100) semiconductor surface have been investigated to gain better understanding of the p-type devices. In particular, the electronic transitions relevant to charge transfer between the dye and the surface have been identified. Excitations have been evaluated by using the time dependent DFT calculations and the roles of frontier orbitals and band edges in transitions have been assessed. The adsorbed dyes can take either upright or slightly tilted geometries depending on the structure of the anchoring group and the binding mode of the dye. The adsorption slightly lowers the NiO band gap, from 4.06 eV to 3.90–3.96 eV depending on the surface–adsorbate system, and the band gaps of the dye molecules by 0.1–0.2 eV. Additionally, the adsorption mode of dye 1 moves the LUMO+1 level down by 0.5 eV. The effective mass of the charge carrier holes is significantly smaller at the NiO surface than in the bulk indicating the importance of the surface conductivity. We also found that the potential drop, i.e. the driving force for charge transfer from NiO to dye molecule depends on the adsorption mode of 1.
Photoexcitation and electron transfer at inorganic–organic interface — a DFT approach

General information
State: Published
Organisations: Department of Physics, Research group: Electronic Structure Theory, Research area: Computational Physics, Department of Chemistry and Bioengineering
Authors: Niskanen, M. O., Kontkanen, O. V., Hukka, T. I., Rantala, T. T.
Number of pages: 1
Publication date: May 2016
Peer-reviewed: Unknown
Event: Paper presented at Optics and Photonics days, Tampere, Finland.
Research output: Scientific › Paper, poster or abstract

Synthesis and biological screening for cytotoxic activity of N-substituted Indolines and morpholines
Development of novel anticancer drugs is inevitable to improve treatment of cancers. In this study, novel derivatives of indoline and morpholine were synthesized and tested for their cytotoxic effects on osteosarcoma and Human Embryonic Kidney cells. To characterize cytotoxicity and the mechanism of cell death, were used cytotoxicity, migration, apoptosis markers and mitochondrial calcium assays. Among the compounds tested, the indoline derivatives, generally, produced a higher cytotoxic effect compared to the morpholine derivatives, in osteosarcoma cells. Specifically, new indoline derivative N-(2-hydroxy-5-nitrophenyl(4′-methylphenyl)methyl)indoline exhibited effective cytotoxic activity, with an IC50 of ~74 μM. The same molecule induced cell death by apoptosis and inhibited migration of the cells. Further, analysis of mitochondrial calcium levels revealed the existence of calcium dependent cell death mechanisms in different cell types. Therefore, N-(2-hydroxy-5-nitrophenyl(4′-methylphenyl)methyl)indoline can be considered as a potential drug-lead compound towards the discovery of new anti-cancer agents.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Research group: Molecular Signaling Lab
Authors: Doan, P., Karjalainen, A., Chandraseelan, J. G., Sandberg, O., Yli-Harja, O., Rosholm, T., Franzén, R., R. Candeias, N., Kandhavelu, M.
Pages: 296-303
Publication date: May 2016
Peer-reviewed: Yes

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Volume: 120
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Scopus rating (2016): SJR 1.272 SNIP 1.562 CiteScore 4.35
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Scopus rating (2014): SJR 1.074 SNIP 1.668 CiteScore 3.84
Scopus rating (2013): SJR 1.209 SNIP 1.876 CiteScore 4.01
Scopus rating (2012): SJR 1.201 SNIP 1.922 CiteScore 4.04
Scopus rating (2011): SJR 1.065 SNIP 1.804 CiteScore 3.75
Scopus rating (2010): SJR 0.877 SNIP 1.692
Scopus rating (2009): SJR 0.955 SNIP 1.843
Scopus rating (2008): SJR 0.9 SNIP 1.603
Scopus rating (2007): SJR 0.833 SNIP 1.501
Scopus rating (2006): SJR 0.723 SNIP 1.405
Scopus rating (2005): SJR 0.673 SNIP 1.243
Scopus rating (2004): SJR 0.714 SNIP 1.294
Scopus rating (2003): SJR 0.677 SNIP 1.349
Scopus rating (2002): SJR 0.579 SNIP 1.006
Effect of Hole Transporting Material on Charge Transfer Processes in Zinc Phthalocyanine Sensitized ZnO Nanorods

The photoinduced electron transfer processes were studied for hybrid systems consisting of self-assembled monolayer of zinc phthalocyanine (ZnPc) assembled on ZnO nanorods and a film of organic hole transporting material (HTM) atop. Polythiophene (P3HT) or Spiro-OMeTAD were used as HTM. The study was carried out by ultrafast transient absorption spectroscopy technique with selective excitation of ZnPc at 680 nm or P3HT at 500 nm. Data analysis revealed that photoexcitation of ZnPc in the structure ZnO|ZnPc|P3HT results in a fast (1.8 ps) electron transfer from ZnPc to ZnO, which is followed by a hole transfer from the ZnPc cation to P3HT roughly in 30 ps. However, in the case of ZnO|ZnPc|Spiro-OMeTAD structure, the primary reaction upon excitation of ZnPc is a fast (0.5 ps) hole transfer from ZnPc to Spiro-OMeTAD, and the second step is electron injection from the ZnPc anion to ZnO in roughly 120 ps. Thus, we demonstrate two structurally very similar hybrid architectures that implement two different mechanisms for photoinduced charge separation found in dye-sensitized or in organic solar cells.

General information
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Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Hakola, H., Sariola-Leikas, E., Efimov, A., Tkachenko, N. V.
Number of pages: 8
Pages: 7044-7051
Publication date: 21 Apr 2016
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Publication information
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Volume: 120
Issue number: 13
ISSN (Print): 1932-7447
Ratings:
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Scopus rating (2015): SJR 1.917 SNIP 1.268 CiteScore 4.68
Scopus rating (2014): SJR 2.027 SNIP 1.448 CiteScore 5.08
Scopus rating (2013): SJR 2.134 SNIP 1.439 CiteScore 5.14
Scopus rating (2012): SJR 2.514 SNIP 1.46 CiteScore 4.98
Scopus rating (2011): SJR 2.32 SNIP 1.457 CiteScore 4.92
Scopus rating (2010): SJR 2.438 SNIP 1.356
Scopus rating (2009): SJR 2.128 SNIP 1.417
Scopus rating (2008): SJR 1.856 SNIP 1.033
Original language: English
ASJC Scopus subject areas: Physical and Theoretical Chemistry, Electronic, Optical and Magnetic Materials, Surfaces, Coatings and Films, Energy(all)
DOI:
10.1021/acs.jpcc.6b01583
Source: Scopus
Source-ID: 84964529902
Research output: Scientific - peer-review » Article
Syntheses, Charge Separation, and Inverted Bulk Heterojunction Solar Cell Application of Phenothiazine-Fullerene Dyads

A series of phenothiazine-fulleropyrrolidine (PTZ-C$_{60}$) dyads having fullerene either at the C-3 aromatic ring position or at the N-position of phenothiazine macrocycle were newly synthesized and characterized. Photoinduced electron transfer leading to PTZ$^{-}$C$_{60}^{\bullet-}$ charge-separated species was established from studies involving femtosecond transient absorption spectroscopy. Because of the close proximity of the donor and acceptor entities, the C-3 ring substituted PTZ-C$_{60}$ dyads revealed faster charge separation and charge recombination processes than that observed in the dyad functionalized through the N-position. Next, inverted organic bulk heterojunction (BHJ) solar cells were constructed using the dyads in place of traditionally used [6,6]-phenyl-C$_{61}$-butyric acid methyl ester (PCBM) and an additional electron donor material poly(3-hexylthiophene) (P3HT). The performance of the C-3 ring substituted PTZ-C$_{60}$ dyad having a polyethylene glycol substituent produced a power conversion efficiency of 3.5% under inverted bulk heterojunction (BHJ) configuration. This was attributed to optimal BHJ morphology between the polymer and the dyad, which was further promoted by the efficient intramolecular charge separation and relatively slow charge recombination promoted by the dyad within the BHJ structure. The present finding demonstrate PTZ-C$_{60}$ dyads as being good prospective materials for building organic photovoltaic devices.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, University of North Texas, VTT Technical Research Centre of Finland
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Publication date: 20 Apr 2016
Peer-reviewed: Yes

Publication information
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Volume: 8
Issue number: 13
ISSN (Print): 1944-8244
Ratings:
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Scopus rating (2015): SJR 2.299 SNIP 1.568 CiteScore 7.38
Scopus rating (2014): SJR 2.126 SNIP 1.64 CiteScore 6.88
Scopus rating (2013): SJR 1.979 SNIP 1.543 CiteScore 6.05
Scopus rating (2012): SJR 2.18 SNIP 1.309 CiteScore 4.94
Scopus rating (2011): SJR 2.017 SNIP 1.396 CiteScore 4.41
Scopus rating (2010): SJR 1.571 SNIP 0.931
Original language: English
ASJC Scopus subject areas: Materials Science(all)
Keywords: femtosecond transient spectroscopy, fullerene, inverted bulk heterojunction, organic photovoltaics, phenothiazine, photoinduced electron transfer
DOIs: 10.1021/acsami.6b00561

Bibliographical note
EXT="Vuorinen, Tommi K."
Source: Scopus
Source-ID: 84964727703
Research output: Scientific - peer-review › Article

Effect of temperature and concentration of precursors on morphology and photocatalytic activity of zinc oxide thin films prepared by hydrothermal route

Zinc oxide (ZnO) is an important semiconductive material due to its potential applications, such as conductive gas sensors, transparent conductive electrodes, solar cells, and photocatalysts. Photocatalytic activity can be exploited in the decomposition of hazardous pollutants from environment. In this study, we produced zinc oxide thin films on stainless steel plates by hydrothermal method varying the precursor concentration (from 0.029 M to 0.16 M) and the synthesis temperature (from 70 °C to 90 °C). Morphology of the synthesized films was examined using field-emission scanning electron microscopy (FESEM) and photocatalytic activity of the films was characterized using methylene blue decomposition tests. It was found that the morphology of the nanostructures was strongly affected by the precursor concentration and the temperature of the synthesis. At lower concentrations zinc oxide grew as thin needlelike nanorods of uniform length and shape and aligned perpendicular to the stainless steel substrate surface. At higher concentrations the shape of the rods transformed towards hexagon shaped units and further on towards flaky platelets. Temperature
changes caused variations in the coating thickness and the orientation of the crystal units. It was also observed, that the photocatalytic activity of the prepared films was clearly dependent on the morphology of the surfaces.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Language Centre, Department of Chemistry and Bioengineering, Research group: Ceramic materials, Research group: Surface Engineering, VTT Technical Research Centre of Finland
Publication date: 15 Apr 2016

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Title of host publication: 3rd International Conference on Competitive Materials and Technology Processes (IC-CMTP3)

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ASJC Scopus subject areas: Engineering(all), Materials Science(all)
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JUFOID=76088
Source: Scopus
Source-ID: 84977566121
Research output: Scientific - peer-review » Conference contribution

Coordination networks incorporating halogen-bond donor sites and azobenzene groups
Two Zn coordination networks, \([\text{[Zn(1)(Py)_2(2-propanol)]_n}] (3)\) and \([\text{[Zn(1)_2(Bipy)_2(2DMF)]_n}] (4)\), incorporating halogen-bond (XB) donor sites and azobenzene groups have been synthesized and fully characterized. Obtaining 3 and 4 confirms that it is possible to use a ligand wherein its coordination bond acceptor sites and XB donor sites are on the same molecular scaffold (i.e., an aromatic ring) without interfering with each other. We demonstrate that XBs play a fundamental role in the architectures and properties of the obtained coordination networks. In 3, XBs promote the formation of 2D supramolecular layers, which, by overlapping each other, allow the incorporation of 2-propanol as a guest molecule. In 4, XBs support the connection of the layers and are essential to firmly pin DMF solvent molecules through \(\text{I} \cdots \text{O}\) contacts, thus increasing the stability of the solvated systems.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Fernandez-Palacio, F., Saccone, M., Priimägi, A., Terraneo, G., Pilati, T., Metrangolo, P., Resnati, G.
Number of pages: 7
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Peer-reviewed: Yes

Publication information
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Volume: 18
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Ratings:
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Scopus rating (2015): SJR 1.063 SNIP 0.999 CiteScore 3.83
Scopus rating (2014): SJR 1.131 SNIP 1.11 CiteScore 3.97
Scopus rating (2013): SJR 1.079 SNIP 1.11 CiteScore 3.81
Arsenic removal from acidic solutions with biogenic ferric precipitates

Treatment of acidic solution containing 5 g/L of Fe(II) and 10 mg/L of As(III) was studied in a system consisting of a biological fluidized-bed reactor (FBR) for iron oxidation, and a gravity settler for iron precipitation and separation of the ferric precipitates. At pH 3.0 and FBR retention time of 5.7 h, 96–98% of the added Fe(II) precipitated (99.1% of which was jarosite). The highest iron oxidation and precipitation rates were 1070 and 28 mg/L/h, respectively, and were achieved at pH 3.0. Subsequently, the effect of pH on arsenic removal through sorption and/or co-precipitation was examined by gradually decreasing solution pH from 3.0 to 1.6 (feed pH). At pH 3.0, 2.4 and 1.6, the highest arsenic removal efficiencies obtained were 99.5%, 80.1% and 7.1%, respectively. As the system had ferric precipitates in excess, decreased arsenic removal was likely due to reduced co-precipitation at pH < 2.4. As(III) was partially oxidized to As(V) in the system. In shake flask experiments, As(V) sorbed onto jarosite better than As(III). Moreover, the sorption capacity of biogenic jarosite was significantly higher than that of synthetic jarosite. The developed bioprocess simultaneously and efficiently removes iron and arsenic from acidic solutions, indicating potential for mining wastewater treatment.

General information
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Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Yildiz Technical University
Authors: Ahoranta, S. H., Kokko, M. E., Papirio, S., Özkaya, B., Puhakka, J.
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Publication date: 5 Apr 2016
Peer-reviewed: Yes

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Volume: 306
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Ratings:
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Scopus rating (2015): SJR 1.651 SNIP 1.935 CiteScore 5.54
Scopus rating (2014): SJR 1.814 SNIP 2.269 CiteScore 5.21
Scopus rating (2013): SJR 1.822 SNIP 2.458 CiteScore 5.09
Scopus rating (2012): SJR 1.985 SNIP 2.467 CiteScore 4.73
Scopus rating (2011): SJR 1.918 SNIP 2.11 CiteScore 4.81
Scopus rating (2010): SJR 1.671 SNIP 1.704
Scopus rating (2009): SJR 1.649 SNIP 2.023
Scopus rating (2008): SJR 1.247 SNIP 1.534
Scopus rating (2007): SJR 0.922 SNIP 1.355
Intramolecular singlet fission (ISF) is a promising photophysical process to construct more efficient light energy conversion systems as one excited singlet state converts into two excited triplet states. Herein, we synthesized and evaluated bent-shaped pentacene dimers as a prototype of ISF to reveal intrinsic characters of triplet states (e.g., lifetimes of triplet excited states). In this study, meta-phenylene-bridged TIPS-pentacene dimer (PcD-3Ph) and 2,2′-bipheynyl bridged TIPS-pentacene dimer (PcD-Biph) were newly synthesized as bent-shaped dimers. In the steady-state spectroscopy, absorption and emission bands of these dimers were fully characterized, suggesting the appropriate degree of electronic coupling between pentacene moieties in these dimers. In addition, the electrochemical measurements were also performed to check the electronic interaction between two pentacene moieties. Whereas the successive two oxidation peaks owing to the delocalization were observed in a directly linked-pentacene dimer (PcD) by a single bond, the cyclic voltammograms in PcD-Biph and PcD-3Ph implied the weaker interaction compared to that of p-phenylene-bridged TIPS-pentacene dimer (PcD-4Ph) and PcD. The femtosecond and nanosecond transient absorption spectra clearly revealed the slower ISF process in bent-shaped pentacene dimers (PcD-Biph and PcD-3Ph), more notably, the slower relaxation of the excited triplet states in PcD-Biph and PcD-3Ph. Namely, the quantum yields of triplet states (Φₜ) by ISF approximately remain constant (ca. 180-200%) in all dimer systems, whereas the lifetimes of the triplet excited states became much longer (up to 360 ns) in PcD-Biph as compared to PcD-4Ph (15 ns). Additionally, the lifetimes of the corresponding triplet states in PcD-Biph and PcD-3Ph were sufficiently affected by solvent viscosity. In particular, the lifetimes of PcD-Biph triplet state in THF/paraffin (1.0 μs) increased up to approximately three times as compared to that in THF (360 ns), whereas those of PcD-4Ph were quite similar in both solvent.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Sakuma, T., Sakai, H., Araki, Y., Mori, T., Wada, T., Tkachenko, N. V., Hasobe, T.
Number of pages: 9
Pages: 1867-1875
Publication date: 31 Mar 2016
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Scopus rating (2015): SJR 1.179 SNIP 1.106 CiteScore 2.78
Scopus rating (2014): SJR 1.154 SNIP 1.071 CiteScore 2.65
Scopus rating (2013): SJR 1.194 SNIP 1.102 CiteScore 2.84
Scopus rating (2012): SJR 1.494 SNIP 1.124 CiteScore 2.78
Scopus rating (2011): SJR 1.402 SNIP 1.135 CiteScore 2.87
Scopus rating (2010): SJR 1.466 SNIP 1.102
Scopus rating (2009): SJR 1.562 SNIP 1.132
Scopus rating (2008): SJR 1.787 SNIP 1.093
Scopus rating (2007): SJR 1.907 SNIP 1.136
Scopus rating (2006): SJR 1.728 SNIP 1.195
Quenching nematicon fluctuations via photo-stabilization

Light localization into optical spatial solitons can be achieved by launching optical beams in nonlocal nonlinear nematic liquid crystals. Such solitons often undergo undesired fluctuations of their trajectories. We demonstrate that partial polymerization in monoacrylate-doped nematic liquid crystals is effective in quenching such fluctuations in transverse space.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Optics, Research group: Nonlinear Optics, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Karimi, N., Alberucci, A., Virkki, M., Priimägi, A., Kauranen, M., Assanto, G.
Number of pages: 3
Pages: 2-4
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Publication information

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Scopus rating (2015): SJR 0.288 SNIP 0.499 CiteScore 0.47
Scopus rating (2014): SJR 0.253 SNIP 0.455 CiteScore 0.45
Scopus rating (2013): SJR 0.346 SNIP 0.732 CiteScore 0.74
Scopus rating (2012): SJR 0.32 SNIP 0.568 CiteScore 1.1
Scopus rating (2011): SJR 0.488 SNIP 2.68 CiteScore 1.52
Scopus rating (2010): SJR 0.347 SNIP 1.029
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Electronic versions:
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DOIs:
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Links:
http://urn.fi/URN:NBN:fi:ttly-201604253877
Research output: Scientific - peer-review › Letter

Agronomic characteristics of five different urban waste digestates

The use of digestate in agriculture is an efficient way to recycle materials and to decrease the use of mineral fertilizers. The agronomic characteristics of the digestates can promote plant growth and soil properties after digestate fertilization but also harmful effects can arise due to digestate quality, e.g. pH, organic matter and heavy metal content. The objective of this study was to evaluate the differences and similarities in agronomic characteristics and the value of five urban waste digestates from different biogas plants treating either food waste, organic fraction of organic solid waste or a mixture of waste-activated sludge and vegetable waste. The digestate agronomic characteristics were studied with chemical
analyses and the availability of nutrients was also assessed with growth experiments and soil mineralization tests. All studied urban digestates produced 5-30% higher ryegrass yields compared to a control mineral fertilizer with a similar inorganic nitrogen concentration, while the feedstock source affected the agronomic value. Food waste and organic fraction of municipal solid waste digestates were characterized by high agronomic value due to the availability of nutrients and low heavy metal load. Waste-activated sludge as part of the feedstock mixture, however, increased the heavy metal content and reduced nitrogen availability to the plant, thus reducing the fertilizer value of the digestate.

**General information**

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**Phenothiazine and carbazole substituted pyrene based electroluminescent organic semiconductors for OLED devices**

Due to their easy availability, low cost and opportunities for exploiting reactions of bromo substituents, 1,3,6,8-tetrabromopyrene has attracted major attention in the organic electronics community for designing and constructing novel classes of pyrene based organic semiconducting functional materials. In the present work, 1,3,6,8-tetrabromo pyrene was transformed into the corresponding tetrasubstituted carbazole and phenothiazine derivatives using the classical Suzuki coupling reaction. These newly synthesized materials with a carbazole substituent (PY-CA) and a phenothiazine substituent (PY-PH) were characterised thoroughly and were successfully used as an active light-emitting layer in organic light emitting diodes which resulted in blue and green emission with promising device performance. PY-CA exhibited the maximum brightness at around 2500 cd m⁻² and the power efficiency of 1.5 lm W⁻¹ while that of PY-PH exhibited 2116 cd m⁻² and 0.45 lm W⁻¹ respectively.
Intrinsic Properties of Two Benzodithiophene-Based Donor–Acceptor Copolymers Used in Organic Solar Cells: A Quantum-Chemical Approach

Conjugated donor–acceptor (D–A) copolymers show tremendous promise as active components in thin-film organic bulk heterojunction solar cells and transistors, as appropriate combinations of D–A units enable regulation of the intrinsic electronic and optical properties of the polymer. Here, the structural, electronic, and optical properties of two D–A copolymers that make use of thieno[3,4-c]pyrrole-4,6-dione as the acceptor and differ by their donor unit—benzo[1,2-b:4,5-b’]dithiophene (BDT) vs the ladder-type heptacyclic benzodi(cyclopentadithiophene)—are compared using density functional theory methods. Our calculations predict some general similarities, although the differences in the donor structures lead also to clear differences. The extended conjugation of the stiff ladder-type donor destabilizes both the highest occupied and lowest unoccupied molecular orbital energies of the ladder copolymer and results in smaller gap energies compared to its smaller counterpart. However, more significant charge transfer nature is predicted for the smaller BDT-based copolymer by natural transition orbitals than for the ladder copolymer. That is, the influence of the acceptor on the copolymer properties is “diluted” to some extent by the already extended conjugation of the ladder-type donor. Thus, the use of stronger acceptor units with the ladder-type donors would benefit the future design of new D–A copolymers.
Cell-based bioreporter assay coupled to HPLC micro-fractionation in the evaluation of antimicrobial properties of the basidiomycete fungus Pycnoporus cinnabarinus

Context: Identification of bioactive components from complex natural product extracts can be a tedious process that aggravates the use of natural products in drug discovery campaigns. Objective: This study presents a new approach for screening antimicrobial potential of natural product extracts by employing a bioreporter assay amenable to HPLC-based activity profiling. Materials and methods: A library of 116 crude extracts was prepared from fungal culture filtrates by liquid-liquid extraction with ethyl acetate, lyophilised, and screened against Escherichia coli using TLC bioautography. Active extracts were studied further with a broth microdilution assay, which was, however, too insensitive for identifying the active microfractions after HPLC separation. Therefore, an assay based on bioluminescent E. coli K-12 (pTetLux1) strain was coupled with HPLC micro-fractionation. Results: Preliminary screening yielded six fungal extracts with potential antimicrobial activity. A crude extract from a culture filtrate of the wood-rotting fungus, Pycnoporus cinnabarinus (Jacq.) P. Karst. (Polyporaceae), was selected for evaluating the functionality of the bioreporter assay in HPLC-based activity profiling. In the bioreporter assay, the IC50 value for the crude extract was 0.10 mg/mL. By integrating the bioreporter assay with HPLC micro-fractionation, the antimicrobial activity was linked to LC-UV peak of a compound in the chromatogram of the extract. This compound was isolated and identified as a fungal pigment phlebiarubrone. Discussion and conclusion: HPLC-based activity profiling using the bioreporter-based approach is a valuable tool for identifying antimicrobial compound(s) from complex crude extracts, and offers improved sensitivity and speed compared with traditional antimicrobial assays, such as the turbidimetric measurement.
Advanced Solid Fuel Characterization for Reactivity and Physical Property Comparison

The main objective of this thesis was to formulate a method with which solid fuel combustion characteristics and physical properties could be accurately compared between different samples. The main study instrument used and further developed in the fuel reactivity tests during this work was a laminar drop-tube reactor (DTR). Five different solid fuel sample types were tested with the DTR. The samples were selected to represent a wide range of possible solid fuel types relevant to energy production in Finland. Fossil coal was selected as a reference fuel. Peat was chosen as it is a commonly co-fired with biomass in Finland. The three other samples, raw, torrefied, and steam-exploded woody biomasses, were chosen to find out how thermochemical pretreatment of biomass feedstock affects the fuel combustion characteristics.

In addition to the DTR tests, the fine grinding energy requirement of the biomass samples was also examined. Moreover, collaboration work with other researchers was conducted to examine the effect of torrefaction on the fine grinding energy requirement, chlorine content, and heating value. Various domestic and foreign wood species were used in these studies. The torrefaction process was noted to reduce the energy required to fine grind the tested sample. It was also noted that during torrefaction the chlorine content of the solid matter was reduced and the specific heating value was slightly increased. Fine grinding the steam-exploded biomass produced more spherical particles compared to the raw and torrefied pellet samples.

The combustion behavior of the five main samples was tested in the DTR. The samples were preground and the particles sieved with vibration sieves with an opening of 100-125 μm. The pyrolysis process was examined separately at a temperature range of 973-1173 K in pure N2. The combined pyrolysis and combustion tests were conducted at a reactor temperature of 1123 K. The O2 concentrations used in the combustion measurements were 3–21 vol-% in either N2 or CO2 atmospheres. The surface temperature of the combusting sample particles was measured with a two-color pyrometer. The initial size distribution of the sample particles as well as their size and geometry evolution as a function of conversion was studied by using optical techniques. The density, specific surface area, and mean pore diameter were measured from the samples with a mercury porosimeter. The reactivity parameters, which describe the pyrolysis and char oxidation rates of the samples, were determined by using the data from the measurements. Using discretized size distribution in the model calculations explained better the measured particle surface temperatures than using a mono sized single particle model. Moreover, combining the optical techniques with the DTR setup provided valuable data on the geometry evolution of the particles.

Based on the reactivity parameters, the sample combustion characteristics could be compared with one another. The reactivity comparison method presented in this thesis relies on consistent DTR measurements, determining accurately the
Synthesis of Benzothiadiazole Derivatives by Applying C–C Cross-Couplings

The benzothiadiazole moiety has been extensively exploited as a building block in the syntheses of efficient organic semiconducting materials during the past decade. In this paper, parallel synthetic routes to benzothiadiazole derivatives, inspired by previous computational findings, are reported. The results presented here show that various C–C cross-couplings of benzothiadiazole, thiophene, and thiazole derivatives can be efficiently performed by applying Xantphos as a ligand of the catalyst system. Moreover, improved and convenient methods to synthesize important chemical building blocks, e.g., 4,7-dibromo-2,1,3-benzothiadiazole, in good to quantitative yields are presented. Additionally, the feasibility of Suzuki–Miyaura and direct coupling methods are compared in the synthesis of target benzothiadiazole derivatives. The computational characterization of the prepared benzothiadiazole derivatives shows that these compounds have planar molecular backbones and the possibility of intramolecular charge transfer upon excitation. The experimental electrochemical and spectroscopic studies reveal that although the compounds have similar electronic and optical properties in solution, they behave differently in solid state due to the different alkyl side-group substitutions in the molecular backbone. These benzothiadiazole derivatives can be potentially used as building blocks in the construction of more advanced small molecule organic semiconductors with acceptor–donor–acceptor motifs.
Nanocomposite Fe$_2$O$_3$?Co$_3$O$_4$ photoanodes for photoelectrochemical H$_2$O splitting were prepared by a plasma-assisted route. Specifically, Fe$_2$O$_3$ nanostructures were grown by plasma enhanced-chemical vapor deposition, followed by cobalt sputtering for different process durations. The systems were annealed in air after, or both prior and after, sputtering of Co, to analyze the treatment influence on functional performances. The interplay between processing conditions and chemico-physical features was investigated by a multi-technique characterization. Photocurrent density measurements in sunlight-assisted H$_2$O splitting revealed a performance improvement upon Co$_3$O$_4$ loading. A cathodic shift of the onset potential was also observed, highlighting Co$_3$O$_4$ activity as catalyst for the oxygen evolution reaction.
Charge separation and charge recombination photophysical studies in a series of perylene–C\textsubscript{60} linear and cyclic dyads

A new donor–acceptor doubly bridged perylenediimide–fullerene dyad (PDI–C\textsubscript{60}, DB-3), where the perylenediimide (PDI) acts as a donor, has been synthesized and studied by time-resolved absorption spectroscopy. The DB-3 undergoes an electron transfer (ET) in both polar and non-polar media under photo-excitation. Structurally the DB-3 dyad resembles four other recently studied dyads (R. K. Dubey et al., Chem. Eur. J., 2013, 19, 6791–6806). Analysis of the ET reactions in this series of dyads was suggests that the electronic coupling for the ET reaction is roughly 0.005 eV, internal reorganization carried out in frame of both classic and semi-quantum ET theories. The result of the analysis for DB-3 energy is 0.16 eV, and outer sphere or solvent reorganization energy is 0.5 and 0.3 eV in benzonitrile and toluene, respectively.

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Scopus rating (2012): SJR 1.916 SNIP 1.184 CiteScore 3.67
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Color Bricks: Building Highly Organized and Strongly Absorbing Multicomponent Arrays of Terpyridyl Perylenes on Metal Oxide Surfaces

Terpyridine-substituted perylenes containing cyclic anhydrides in the peri position were synthesized. The anhydride group served as an anchor for assembly of the terpyridyl-crowned chromophores as monomolecular layers on metal oxide
surfaces. Further coordination with Zn2+ ions allowed for layer-by-layer formation of supramolecular assemblies of perylene imides on the solid substrates. With properly selected anchor and linker molecules it was possible to build high quality structures of greater than ten successive layers by a simple and straightforward procedure. The prepared films were stable and had a broad spectral coverage and high absorbance. To demonstrate their potential use, the synthesized dyes were employed in solid-state dye-sensitized solar cells, and electron injection from the perylene antennas to titanium dioxide was observed.

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Scopus rating (2012): SJR 2.884 SNIP 1.294 CiteScore 5.55
Scopus rating (2011): SJR 2.726 SNIP 1.336 CiteScore 5.46
Scopus rating (2010): SJR 2.527 SNIP 1.292
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Scopus rating (2008): SJR 2.887 SNIP 1.407
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Scopus rating (2006): SJR 2.911 SNIP 1.505
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Scopus rating (2004): SJR 2.32 SNIP 1.472
Scopus rating (2003): SJR 2.156 SNIP 1.45
Scopus rating (2002): SJR 2.554 SNIP 1.472
Scopus rating (2001): SJR 2.834 SNIP 1.612
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Toward the prediction of porous membrane permeability from morphological data

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Alginate microgels created by selective coalescence between core drops paired with an ultrathin shell

We report a highly biocompatible and practical protocol to create alginate microgels for bioactive encapsulation. Double-emulsion drops composed of dual cores enclosed by an ultrathin shell are prepared in a capillary microfluidic device, which exhibit selective coalescence between the cores. When the cores are laden with alginate precursors and divalent ions, respectively, coalescence leads to the formation of alginate microgels in the fused core of double-emulsion drops. The microgel can be rapidly released into a continuous water phase by rupturing the liquid shell. This method neither involves any toxic chemical cues for gelation nor long-term exposure to oil, thereby providing highly biocompatible encapsulation.

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Authors: Lee, T. Y., Ramasamy, P., Oh, Y. K., Lee, K., Kim, S. H.
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Anaerobes in bioelectrochemical systems

In bioelectrochemical systems (BES), the catalytic activity of anaerobic microorganisms generates electrons at the anode which can be used, for example, for the production of electricity or chemical compounds. BES can be used for various purposes, including wastewater treatment, production of electricity, fuels and chemicals, biosensors, bioremediation, and desalination. Electrochemically active microorganisms are widely present in the environment and they can be found, in sediment, soil, compost, wastewaters and their treatment plants. Exoelectrogens are microorganisms capable of donating electrons to anode electrode or accepting electrons from cathode electrode and are mainly responsible for current generation or use in BES. However, current generation from fermentable substrates often requires the presence of electrochemically inactive microorganisms that break down complex substrates into metabolites which can be further utilized by exoelectrogens. The growth and electron transfer efficiency of anaerobes depend on several parameters, such as system architecture, electrode material and porosity, electrode potential and external resistance, pH, temperature, substrate concentration, organic loading rate, and ionic strength. In this chapter, the principles and microbiology of bioelectrochemical systems as well as selective factors for exoelectrogens are reviewed. The anaerobic microorganisms and their electron transfer mechanisms at the anode and cathode are described and future aspects are briefly discussed.
A study on raw, torrefied, and steam-exploded wood: Fine grinding, drop-tube reactor combustion tests in N₂/O₂ and CO₂/O₂ atmospheres, particle geometry analysis, and numerical kinetics modeling

The purpose of this study was to compare the fine grinding properties and combustion behavior of three wood pellet products: raw, torrefied, and steam-exploded wood. The energy required to fine grind the pellets was tested, and so was the geometry and size distribution of the resulting ground products. Out of all the samples the steam-exploded wood pellet required the most energy for grinding. However, it also produced more sphere-like particles compared to the other two types of samples. The combustion behavior of the samples was tested in a laminar drop-tube reactor (DTR). The samples were preground and the particles were sieved with vibration sieves with an opening of 112–125 μm. The pyrolysis process was examined separately at a temperature range of 973–1173 K. The combined pyrolysis and combustion tests were carried out at a reactor temperature of 1123 K. The O₂ concentrations used in the measurements were 3–21 vol-% in either N₂ or CO₂ atmospheres. The initial size distribution of the sample particles as well as their diameter evolution during pyrolysis and combustion was studied by using optical techniques. The surface temperature of the combusting particles was measured with a two-color pyrometer from within the DTR. The density, specific surface area, and pore diameter were measured from the ground samples with a mercury porosimeter. The chemical kinetic parameters, which describe the pyrolysis and char oxidation rates of the samples, were determined by using the data from the measurements.

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Scopus rating (2013): SJR 1.811 SNIP 2.595 CiteScore 4.31
Scopus rating (2012): SJR 1.852 SNIP 2.465 CiteScore 3.99
Scopus rating (2011): SJR 2.093 SNIP 2.427 CiteScore 4.1
Scopus rating (2010): SJR 1.984 SNIP 2.319
Scopus rating (2009): SJR 2.012 SNIP 2.277
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Scopus rating (2005): SJR 1.623 SNIP 1.73
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A Three-Component Assembly Promoted by Boronic Acids Delivers a Modular Fluorophore Platform (BASHY Dyes)

A multicomponent reaction, symbolized on the cover by a puzzle, was used to prepare a molecularly diverse series of boron-containing heterocyclic dyes [boronic acid salicylidenehydrazone (BASHY) dyes]. The dyes are strongly fluorescent in the green-yellow spectral range and were applied in cell-staining protocols to visualize lipid droplets (as shown in the background of the picture). More information can be found in the Full Paper by U. Pischel, et al. (DOI: 10.1002/chem.201503943).

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Scopus rating (2002): SJR 2.554 SNIP 1.472
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Biological and Bioelectrochemical Recovery of Critical and Scarce Metals

Metal-bearing solid and liquid wastes are increasingly considered as secondary sources of critical and scarce metals. Undoubtedly, microorganisms are a cost-effective resource for extracting and concentrating diffuse elements from secondary sources. Microbial biotechnology for extracting base metals from ores and treatment of metal-laden wastewaters has already been applied at full scale. By contrast, microbe-metal interactions in the recovery of scarce metals and a few critical metals have received attention, whereas the recovery of many others has been barely explored. Therefore, this article explores and details the potential application of microbial biotechnologies in the recovery of critical and scarce metals. In the past decade bioelectrochemical systems have emerged as a new technology platform for metal recovery coupled to the removal of organic matter. Overview of potential applications of microorganisms in critical metal
recovery. Engineering of microbe-metal interactions for recovering rare earth elements and platinum group metals. Reductive mineral dissolution is a new dimension to biomining. Bioelectrochemical systems offer a new technology platform in metal recovery.

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Authors: Nancharaiah, Y. V., Mohan, S. V., Lens, P. N. L.

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- Scopus rating (2012): SJR 3.353 SNIP 3.083 CiteScore 9.77
- Scopus rating (2011): SJR 3.321 SNIP 3.05 CiteScore 9.82
- Scopus rating (2010): SJR 3.062 SNIP 2.734
- Scopus rating (2009): SJR 2.751 SNIP 2.682
- Scopus rating (2008): SJR 2.509 SNIP 2.185
- Scopus rating (2007): SJR 2.361 SNIP 2.393
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- Scopus rating (2005): SJR 1.911 SNIP 2.109
- Scopus rating (2004): SJR 1.797 SNIP 1.762
- Scopus rating (2003): SJR 1.552 SNIP 2.063
- Scopus rating (2002): SJR 1.633 SNIP 1.893
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Research output: Scientific - peer-review › Article

**Biomass-Based and Oxidant-Free Preparation of Hydroquinone from Quinic Acid**

A biomass-based route to the preparation of hydroquinone starting from the renewable starting material quinic acid is described. Amberlyst-15 in the dry form promoted the one-step formation of hydroquinone from quinic acid in toluene without any oxidants or metal catalysts in 72% yield. Several acidic polymer-based resins and organic acids as promoters as well as a variety of reaction conditions were screened including temperature, concentration and low- and high-boiling-point solvents. A 1:4 (w/w) ratio of quinic acid/Amberlyst-15 was determined to be optimal to promote hydroquinone formation with only traces of a dimeric side-product. A mechanism has been proposed based on the decarbonylation of protonated quino-1,5-lactone that is supported by experimental and computational calculation data.

**General information**

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The purpose of this study was to assess the dissolution of Si, Fe, Cu and Zn from a smelter slag sample under acidic chemical and bacterial leaching conditions. The Cu-containing solid phases were Cu-sulfides (57% distribution), fayalite (18%) and metallic Cu (16%). Zn was mostly associated with fayalite, magnetite and Na-silicate phases (Σ94%). Two mixed cultures (HB1 and HB2) were enriched from samples taken from the slag lagoon site at the smelter location. Comparable results of metal dissolution were obtained with the two mixed cultures. The enrichment culture HB1 was characterized further by denaturing gradient gel electrophoresis (DGGE) of polymerase chain reaction amplified 16S rRNA genes. Based on the 16S rRNA gene sequences, culture HB1 contained at least Acidithiobacillus ferrivorans and Alicyclobacillus cycloheptanicus, with sequences of three DGGE bands matching distantly with Alicyclobacillus tolerans and Alicyclobacillus herbarium in the database. Alicyclobacillus spp. have not been previously associated with slag lagoons or slag bioleaching. Approximately 80% Cu and 25% Zn were dissolved from the slag (10% pulp) in shake flasks when S\textsuperscript{0} was provided for the bacteria to produce H\textsubscript{2}SO\textsubscript{4}. Bioleaching in stirred tanks was conducted at controlled pH values and was practiced at pH levels promoting metal dissolution and suppressing iron and silicate solubilization from fayalite and Na-silicate. Chemical leaching at pH 2.3-4.0 did not yield substantial dissolution of valuable metals.
Compact hematite buffer layer as a promoter of nanorod photoanode performances

The effect of a thin α-Fe2O3 compact buffer layer (BL) on the photoelectrochemical performances of a bare α-Fe2O3 nanorods photoanode is investigated. The BL is prepared through a simple spray deposition onto a fluorine-doped tin oxide (FTO) conducting glass substrate before the growth of a α-Fe2O3 nanorods via a hydrothermal process. Insertion of the hematite BL between the FTO and the nanorods markedly enhances the generated photocurrent, by limiting undesired losses of photogenerated charges at the FTO||electrolyte interface. The proposed approach warrants a marked improvement of material performances, with no additional thermal treatment and no use/dispersion of rare or toxic species, in agreement with the principles of green chemistry.
Controllable Electronic Structures and Photoinduced Processes of Bay-Linked Perylenediimide Dimers and a Ferrocene-Linked Triad

A series of perylene-3,4,9,10-bis(dicarboximide) (PDI) dimers linked through the bay regions was systematically synthesized to examine the electronic structures and photophysical properties in dependence on the distance and orientation between the two PDI units. The spectroscopic and electrochemical measurements suggested that the coupling value of a directly linked PDI dimer \((\text{PDI})_2\) is much larger than those of para- and meta-phenylene-bridged PDI dimers \(p-(\text{PDI})_2\) and \(m-(\text{PDI})_2\). The width of Davydov splitting was quantitatively evaluated to compare the coupling values between the two PDI units in these dimers by absorption spectroscopy in frozen 2-methyl-THF. Excimer formation of PDI dimers induced the strong fluorescence quenching and large red-shifts. Femtosecond transient absorption revealed a broad absorption derived from an excimer in the range from about 600nm to the near-IR region. The rate constants of formation and decay of the excimer are strongly dependent on the coupling values. Time-resolved measurements on ferrocene-linked \(p-(\text{PDI})_2\) revealed a competition between the photoinduced processes of electron transfer and excimer formation in PhCN, which is in sharp contrast with the sole electron-transfer process in toluene.
Downstream integration of microalgae harvesting and cell disruption by means of cationic surfactant-decorated Fe$_3$O$_4$ nanoparticles

Microalgal biofuel, albeit an exciting potential fossil-fuel-replacement candidate, still requires the development of more advanced downstream processing technology for its price competitiveness. The major challenge in a microalgae-based biorefinery is the efficient separation of microalgae from low-concentration culture broth. The post-harvesting cell-disruption step necessary to render microalgae suitable for lipid extraction, moreover, further raises energy consumption and cost. For the mitigation of biorefinery complexity and costs, we suggest herein a new scheme that integrates the critical downstream processes (harvesting and cell disruption) by means of cationic surfactant-decorated Fe$_3$O$_4$ nanoparticles. The cationic surfactants’ quaternary ammonium heads play an important role in not only flocculating negatively charged microalgae but also weakening thick cell walls. In the present study, the harvesting efficiency and cell-damaging effects of three cationic surfactants - cetrimonium bromide (CTAB), cetylpyridinium chloride (CPC), and cetylpyridinium bromide (CPB) - were evaluated. The CTAB-decorated Fe$_3$O$_4$ nanoparticles, which were found to be the most effective, achieved a 96.6% microalgae harvesting efficiency at a dosage of 0.46 g particle per g cell. Next, for the purposes of magnetic nanoparticle recycling and high-purity microalgal biomass obtainment, microalgae detachment from microalgae-Fe$_3$O$_4$ flocs was performed by addition of an anionic surfactant, sodium dodecyl sulfate (SDS). The detached CTAB-decorated Fe$_3$O$_4$ nanoparticles showed a steady reuse efficiency of about 80%. Furthermore, microalgae harvesting by CTAB-decorated Fe$_3$O$_4$ nanoparticles could contribute to a great improvement in the total extracted lipid content and greener wet extraction without the additional energy-intensive cell-disruption step, thus demonstrating the cell-disruption ability of CTAB-decorated Fe$_3$O$_4$ nanoparticles.

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Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, National NanoFab Center, Korea Institute of Energy Research, Korea Advanced Institute of Science and Technology (KAIST), Chungnam National University
Authors: Seo, J. Y., Ramasamy, P., Kim, B., Seo, J. C., Park, J. Y., Na, J. G., Jeon, S. G., Park, S. B., Lee, K., Oh, Y. K.
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Effect of source-separated urine storage on estrogenic activity detected using bioluminescent yeast *Saccharomyces cerevisiae*

The objective was to demonstrate that a microbial whole cell biosensor, bioluminescent yeast, *Saccharomyces cerevisiae* (BMAEREluc/ER alpha) can be applied to detect overall estrogenic activity from fresh and stored human urine. The use of source-separated urine in agriculture removes a human originated estrogen source from wastewater influents, subsequently enabling nutrient recycling. Estrogenic activity in urine should be diminished prior to urine usage in agriculture in order to prevent its migration to soil. A storage period of 6 months is required for hygienic reasons; therefore, estrogenic activity monitoring is of interest. The method measured cumulative female hormone-like activity. Calibration curves were prepared for estrone, 17 beta-estradiol, 17 alpha- ethinylestradiol and estriol. Estrogen concentrations of 0.29-29,640 μg L⁻¹ were detectable while limit of detection corresponded to 0.28-35 μg L⁻¹ of estrogens. The yeast sensor responded well to fresh and stored urine and gave high signals corresponding to 0.38-3,804 μg L⁻¹ of estrogens in different urine samples. Estrogenic activity decreased during storage, but was still higher than in fresh urine implying insufficient storage length. The biosensor was suitable for monitoring hormonal activity in urine and can be used in screening anthropogenic estrogen-like compounds interacting with the receptor.
Enhanced adsorption of orthophosphate and copper onto hydrochar derived from sewage sludge by KOH activation

Hydrothermal carbonization producing hydrochar from organic waste is increasingly gaining attention to deal with the challenge of excess waste activated sludge produced during centralized aerobic wastewater treatment. Hydrochar is used as an adsorbent for the removal of organics, metals and biotic contaminants. This study demonstrated the application of KOH activated hydrochar, called enhanced hydrochar (EHC) derived from sewage sludge, for the removal of orthophosphate from wastewater by means of batch adsorption, zetametry and infrared spectroscopy. The maximum $Q_{e-PO_4^{3-}}$ of EHC was 14.3 mg orthophosphate adsorbed per g of EHC when the initial orthophosphate concentration was increased to 150 mg L$^{-1}$. The application of orthophosphate removal by EHC from the effluent of a constructed wetland was demonstrated by achieving more than 97% orthophosphate removal at an EHC dosage of 6.0 g L$^{-1}$ and an initial orthophosphate concentration of 13.1 mg L$^{-1}$. pH dependent adsorption experiments and infrared spectroscopy showed the orthophosphate removal by EHC was due to the replacement of hydroxyl groups by orthophosphate in the EHC. Acid-base titration showed the KOH washing of the raw hydrochar (RHC) led to a 1.7 times increase in the hydroxyl groups in EHC compared to RHC. This study further confirmed the higher uptake capacity of EHC compared to RHC towards copper as a model divalent cation. EHC can thus be applied for the removal of both anions (orthophosphate) and cations (copper) from wastewater.

Formation and stability of porphyrin and phthalocyanine self-assembled monolayers on ZnO surfaces

Formation of self-assembled monolayers (SAMs) of three porphyrin and one phthalocyanine derivatives on thin ZnO film was studied by monitoring absorption spectra of the samples. The compounds were equipped with carboxylic or phosphate groups to bind to the surface. The SAM formation was found to be fast. The layer was formed in less than 15 min for all studied porphyrins, and 30 min was sufficient to form phthalocyanine layer. For porphyrins with different anchor groups the SAM formation was too fast to see any difference between the anchoring groups. The stability of SAMs was
tested then by immersing the samples into neat solvents. Upon immersion the SAMs were gradually losing the
absorbance for all the compounds with degradation trends being in line with pKa values of the binding groups of the same
type. However, even for the weakest binding group the SAM was relatively stable after a few tens of minutes of washing,
which was sufficient to remove physisorbed compounds but the SAM was essentially not destroyed. Comparison of SAMs
on thin films with SAMs on ZnO nanorods and TiO2 nanoparticle films indicated the same fast layer formation but
relatively weaker SAMs stability, showing 20–40% faster absorption losses during the washing.

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Authors: Hakola, H., Sariola-Leikas, E., Jäntti, P., Mokus, T., Stranius, K., Efimov, A., Tkachenko, N. V.

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Scopus rating (2012): SJR 0.62 SNIP 0.537 CiteScore 1.36
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Scopus rating (2005): SJR 0.632 SNIP 0.593
Scopus rating (2004): SJR 0.646 SNIP 0.667
Scopus rating (2003): SJR 0.591 SNIP 0.88
Scopus rating (2002): SJR 0.86 SNIP 1.153
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**High-Yield Excited Triplet States in Pentacene Self-Assembled Monolayers on Gold Nanoparticles through Singlet Exciton Fission**

One of the major drawbacks of organic-dye-modified self-assembled monolayers on metal nanoparticles when employed
for efficient use of light energy is the fact that singlet excited states on dye molecules can be easily deactivated by means
of energy transfer to the metal surface. In this study, a series of 6,13-bis(triisopropylsilylvinyl)pentacene-alkanethiolate
monolayer protected gold nanoparticles with different particle sizes and alkane chain lengths were successfully
synthesized and were employed for the efficient generation of excited triplet states of the pentacene derivatives by singlet
fission. Time-resolved transient absorption measurements revealed the formation of excited triplet states in high yield
(172±26%) by suppressing energy transfer to the gold surface.
Homologation Reaction of Ketones with Diazo Compounds

This review covers the addition of diazo compounds to ketones to afford homologated ketones, either in the presence or in the absence of promoters or catalysts. Reactions with diazoalkanes, aryldiazomethanes, trimethylsilyldiazomethane, α-diazo esters, and disubstituted diazo compounds are covered, commenting on the complex regiochemistry of the reaction and the nature of the catalysts and promoters. The recent reports on the enantioselective version of ketone homologation reactions are gathered in one section, followed by reports on the use of cyclic ketones ring expansion in total synthesis. Although the first reports of this reaction appeared in the literature almost one century ago, the recent achievements, in particular, for the asymmetric version, forecast the development of new breakthroughs in the synthetically valuable field of diazo chemistry.

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Authors: Candeias, N. R., Paterna, R., Gois, P. M. P.
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Metathesis Reactions on Solid-Phase: Towards New Synthesis Challenges

Today there are many types of transition-metal-catalyzed carbon–carbon bond-forming reactions. Of these, the olefin metathesis has made possible a wide range of transformations with commercially available and easily handled catalysts. Olefin metathesis is widely considered as one of the most powerful synthetic tool in organic chemistry. During the last 20 years many new catalysts with excellent selectivity and efficiency have been developed, also to be used in solid phase organic chemistry protocols. The understanding of the mechanisms and interactions between the catalyst and substrate has resulted that an increasing number of research groups have employed these reactions in multistep procedures and in the synthesis of active pharmaceutical ingredients and natural products. Although the olefin metathesis reaction still proceeds better in homogeneous phase, some structural modifications of the catalyst and new approaches for immobilization have provided interesting possibilities towards more efficient use also in heterogeneous phase. To celebrate 10 years since the Nobel Prize in Chemistry given to Yves Chauvin, Richard Schrock and Robert Grubbs for the “development of the metathesis method in organic synthesis” and to summarize recent results obtained in the field of solid phase metathesis chemistry this short review was written.
In this work we report the antibacterial activity of alkylaminophenols. A series of such compounds was prepared by a multicomponent Petasis-borono Mannich reaction starting from salicylaldehyde and its derivatives. The obtained compounds were tested against a large panel of microorganisms, Gram-positive and Gram-negative bacteria, and a yeast. Among the several tertiary amine derivatives tested, indoline-derived aminophenols containing a nitro group at the para-phenol position showed considerable activity against bacteria tested with minimal inhibitory concentrations as low as 1.36 μm against Staphylococcus aureus and Mycobacterium smegmatis. Cytotoxicity of the new para-nitrophenol derivatives was observed only at concentrations much higher than those required for antibacterial activity.
On describing the optoelectronic characteristics of poly(benzodithiophene-co-quinoxaline)-fullerene complexes: The influence of optimally tuned density functionals

Here, we investigate the effects of both tuning the range-separation parameter of long-range corrected (LRC) density functionals and including dispersion corrections on describing the local optoelectronic properties of polymer-fullerene interfaces that are critical to the performance of polymer solar cells (PSCs). Focusing on recently studied (Chen, et al., Chem. Mater., 2012, 24, 4766-4772) PSC active layers derived from poly(benzodithiophene-co-quinoxaline) and substituted fullerene PC71BM, we compare the performance of global hybrid functionals (B3LYP and B3LYP-D) alongside two LRC functionals (ωB97X and ωB97X-D) and their optimally tuned (OT) analogs (OT-ωB97X and OT-ωB97X-D). Our results confirm that OT-LRC functionals generally improve the description of the optical properties of the individual materials with respect to experiment. For electron-donor (eD)-electron-acceptor (eA) complexes used to describe the local optoelectronic properties of the material interface, PC71BM is found to preferentially settle near the quinoxaline acceptor units on the copolymer backbone, regardless of the functional, though dispersion corrections have a strong influence on the intermolecular distances and, in turn, the nature of the excited states. All functionals yield very similar descriptions of the transition maxima for the complexes, i.e. predominant local excitations on the copolymer. Importantly, tuning the range-separation parameter of the LRC functional is shown to have a profound effect, as the OT functionals allow for the description of the charge transfer states of the eD-eA complexes, while the non-tuned LRC functionals predict only local intramolecular excitations. These results hold considerable importance for deriving the appropriate physical understanding of the interfacial structure-property-function relationships of PSCs.
Photoinduced nonlinear optical response in azobenzene-functionalized molecular glass

We show that methylaminotriazine molecular glass functionalized with the azobenzene derivative Disperse Red 1 shows equally strong second-order nonlinear optical response as well-known polymers with the same photoactive component. Furthermore, even high chromophore loading does not adversely affect the nonlinear response. This suggests that chromophore-chromophore intermolecular interactions do not greatly limit the response of such molecular glasses, which therefore provide an excellent materials platform for nonlinear optical applications.

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Scopus rating (2012): SJR 2.587 SNIP 2.145 CiteScore 3.85
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Scopus rating (2010): SJR 2.943 SNIP 2.466
Scopus rating (2009): SJR 3.092 SNIP 2.669
Scopus rating (2008): SJR 3.195 SNIP 2.393
Scopus rating (2007): SJR 3.27 SNIP 2.032
Scopus rating (2006): SJR 3.233 SNIP 2.326
Scopus rating (2005): SJR 3.334 SNIP 2.379
Photoresponsive liquid-crystalline polymer films bilayered with an inverse opal structure
An inverse opal film was layered to a photodeformable film, and its photoresponsive behavior was investigated. This bilayer films composed of colorless photonic crystal using inverse opal structures and colored photoresponsive layers with azobenzene-containing CLCP.

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Authors: Akamatsu, N., Aizawa, M., Tatsumi, R., Hisano, K., Priimägi, A., Shishido, A.
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Scopus rating (2014): SJR 0.295 SNIP 0.588 CiteScore 0.85
Scopus rating (2013): SJR 0.327 SNIP 0.699 CiteScore 0.87
Scopus rating (2012): SJR 0.429 SNIP 0.604 CiteScore 0.91
Scopus rating (2011): SJR 0.382 SNIP 0.587 CiteScore 0.86
Scopus rating (2010): SJR 0.371 SNIP 0.641
Scopus rating (2009): SJR 0.398 SNIP 0.644
Scopus rating (2008): SJR 0.483 SNIP 0.664
Scopus rating (2007): SJR 0.466 SNIP 0.613
Scopus rating (2006): SJR 0.591 SNIP 0.848
Scopus rating (2005): SJR 0.338 SNIP 0.558
Scopus rating (2004): SJR 0.509 SNIP 0.727
Scopus rating (2003): SJR 0.4 SNIP 0.744
Scopus rating (2002): SJR 0.528 SNIP 0.922
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Sorption of zinc onto elemental selenium nanoparticles immobilized in Phanerochaete chrysosporium pellets

The use of a novel hybrid biosorbent, elemental selenium nanoparticles (nSe⁰) immobilized in pellets of Phanerochaete chrysosporium, to remove Zn from aqueous solutions was investigated. Fungal pellets containing nSe⁰ (nSe⁰-pellets) showed to be better biosorbents as they removed more Zn (88.1 ± 5.3 %) compared to Se-free fungal pellets (56.2 ± 2.8 %) at pH 4.5 and an initial Zn concentration of 10 mg L⁻¹. The enhanced sorption capacity of nSe⁰-pellets was attributed to a higher concentration of sorption sites resulting in a more negative surface charge density, as determined by analysis of the potentiometric titration data. Fourier transform infrared spectroscopy (FT-IR) analysis of fungal pellets prior to and after being loaded with Zn showed the functional groups, including hydroxyl and carboxyl groups, involved in the sorption process. The experimental data indicated that the sorption rate of the nSe⁰-pellets fitted well to the pseudo-second order kinetic model ($R^2 = 0.99$), and the sorption isotherm was best represented by the Sips model (Langmuir-Freundlich) with heterogeneous factor $n = 1$ ($R^2 = 0.99$), which is equivalent to the Langmuir model. Operational advantages of fungal pelleted reactors and the Zn removal efficiencies achieved by nSe⁰-pellets under mild acidic conditions make nSe⁰-pellet based bioreactors an efficient biosorption process.
Superfluorinated Ionic Liquid Crystals Based on Supramolecular, Halogen-Bonded Anions

Unconventional ionic liquid crystals in which the liquid crystallinity is enabled by halogen-bonded supramolecular anions $[C_{n}F_{2n+1}]^{-} \cdot \cdot \cdot I \cdot \cdot \cdot I \cdot \cdot \cdot C_{n}F_{2n+1}]$ are reported. The material system is unique in many ways, demonstrating for the first time 1)ionic, halogen-bonded liquid crystals, and 2) imidazolium-based ionic liquid crystals in which the occurrence of liquid crystallinity is not driven by the alkyl chains of the cation.

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Scopus rating (2013): SJR 5.681 SNIP 2.204 CiteScore 10.7
Scopus rating (2012): SJR 6.362 SNIP 2.338 CiteScore 10.55
Scopus rating (2011): SJR 6.062 SNIP 2.387 CiteScore 10.75
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Scopus rating (2008): SJR 5.438 SNIP 2.115
Scopus rating (2006): SJR 4.71 SNIP 2.119
Scopus rating (2005): SJR 4.7 SNIP 2.295
Scopus rating (2004): SJR 4.165 SNIP 2.166
Scopus rating (2003): SJR 3.41 SNIP 2.126
Scopus rating (2002): SJR 3.659 SNIP 2.146
Scopus rating (2001): SJR 3.695 SNIP 2.07
The effect of urine storage on antiviral and antibiotic compounds in the liquid phase of source-separated urine

The behaviour of pharmaceuticals related to the human immunodeficiency virus treatment was studied in the liquid phase of source-separated urine during six-month storage at 20°C. Six months is the recommended time for hygienization and use of urine as fertilizer. Compounds were spiked in urine as concentrations calculated to appear in urine. Assays were performed with separate compounds and as therapeutic groups of antivirals, antibiotics and anti-tuberculotics. In addition, urine was amended either with faeces or urease inhibitor. The pharmaceutical concentrations were monitored from filtered samples with solid phase extraction and liquid chromatography. The concentration reductions of the studied compounds as such or with amendments ranged from less than 1% to more than 99% after six-month storage. The reductions without amendments were 41.9–99% for anti-tuberculotics; <52% for antivirals (except with 3TC 75.6%) and <50% for antibiotics. In assays with amendments, the reductions were all <50%. Faeces amendment resulted in similar or lower reduction than without it even though bacterial activity should have increased. The urease inhibitor prevented ureolysis and pH rise but did not affect pharmaceutical removal. In conclusion, removal during storage might not be enough to reduce risks associated with the studied pharmaceuticals, in which case other feasible treatment practises or urine utilization means should be considered.

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Scopus rating (2013): SJR 0.488 SNIP 0.672 CiteScore 1.3
Scopus rating (2012): SJR 0.645 SNIP 0.877 CiteScore 1.47
Scopus rating (2011): SJR 0.597 SNIP 0.691 CiteScore 1.35
Scopus rating (2010): SJR 0.491 SNIP 0.473
Scopus rating (2009): SJR 0.395 SNIP 0.422
Scopus rating (2008): SJR 0.422 SNIP 0.581
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Scopus rating (2003): SJR 0.538 SNIP 0.641
Use of laboratory anaerobic digesters to simulate the increase of treatment rate in full-scale high nitrogen content sewage sludge and co-digestion biogas plants

The aim of this study was to assess the effect of increasing feedstock treatment rate on the performance of full-scale anaerobic digestion using laboratory-scale reactors with digestate and feedstock from full-scale digesters. The studied nitrogen-containing feedstocks were i) a mixture of industrial by-products and pig slurry, and ii) municipal sewage sludge, which digestion was studied at 41 and 52 degrees C, respectively. This study showed the successful reduction of hydraulic retention times from 25 and 20 days to around 15 days, which increased organic loading rates from 2 to 3.5 kg volatile solids (VS)/m(3) d and 4 to 6 kg VS/m(3) d. As a result, the optimum retention time in terms of methane production and VS removal was 10-15% lower than the initial in the full-scale digesters. Accumulation of acids during start-up of the
co-digestion reactor was suggested to be connected to the high ammonium nitrogen concentration and intermediate temperature of 41 degrees C. (C) 2016 Elsevier Ltd. All rights reserved.

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Scopus rating (2014): SJR 2.41 SNIP 2.104 CiteScore 5.3
Scopus rating (2013): SJR 2.412 SNIP 2.503 CiteScore 5.97
Scopus rating (2012): SJR 2.389 SNIP 2.465 CiteScore 5.25
Scopus rating (2011): SJR 2.314 SNIP 2.508 CiteScore 5.56
Scopus rating (2010): SJR 2.086 SNIP 2.355
Scopus rating (2009): SJR 1.912 SNIP 2.231
Scopus rating (2008): SJR 1.734 SNIP 2.732
Scopus rating (2007): SJR 1.529 SNIP 2.423
Scopus rating (2006): SJR 1.315 SNIP 1.98
Scopus rating (2005): SJR 1.269 SNIP 2.006
Scopus rating (2004): SJR 1.197 SNIP 1.659
Scopus rating (2003): SJR 0.948 SNIP 1.639
Scopus rating (2002): SJR 0.882 SNIP 1.3
Scopus rating (2001): SJR 0.541 SNIP 1.208
Scopus rating (2000): SJR 0.464 SNIP 1.049
Scopus rating (1999): SJR 0.669 SNIP 1.061
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DOI:
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EXT="Tampio, Elina"
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**Preparation and antimicrobial characterization of silver-containing packaging materials for meat**
In food technology, antimicrobial packaging materials could inhibit or limit the growth of spoilage bacteria and thus improve the shelf life of packaged products. The present study provides new insights into the preparation and antimicrobial characterization of silver-containing packaging materials and their efficacy against typical meat spoilage bacteria. Antimicrobial efficacy of packaging films produced by coextrusion or liquid flame spray process was determined by bioluminescence imaging and conventional antimicrobial assay. Fresh pork sirloin was packaged in selected films and composition of meat microbiota was analyzed by 16S rRNA amplicon sequencing. Shelf life of meat was not affected by any of the silver-containing packaging films, even though meat microbiota mostly consisted of bacteria that were inhibited or retarded in vitro by nanoscale silver coating. This may be due to different release dynamics of silver ions on meat surfaces compared to the circumstances in the antimicrobial assay or interactions between silver and amino acids.
Graphene-intercalated Fe₂O₃/TiO₂ heterojunctions for efficient photoelectrolysis of water

Interfacial modification of α-Fe₂O₃/TiO₂ multilayer photoanodes by intercalating few-layer graphene (FLG) was found to improve water splitting efficiency due to superior transport properties, when compared to individual iron and titanium oxides and heterojunctions thereof. Both metal oxides and graphene sheets were grown by plasma-enhanced chemical vapor deposition. Compared to the onset potential achieved for α-Fe₂O₃ films (1 V vs. RHE), the α-Fe₂O₃/TiO₂ bilayer structure yielded a better onset potential (0.3 V vs. RHE). Heterojunctioned bilayers exhibited a higher photocurrent density (0.32 mA cm⁻² at 1.23 V vs. RHE) than the single α-Fe₂O₃ layer (0.22 mA cm⁻² at 1.23 V vs. RHE), indicating more efficient light harvesting and higher concentration of photogenerated charge carriers. For more efficient charge transport at the interface, a few layer graphene sheet was intercalated into the α-Fe₂O₃/TiO₂ interface, which substantially increased the photocurrent density to 0.85 mA cm⁻² (1.23 V vs. RHE) and shifted the onset potential (0.25 V vs. RHE). Ultrafast transient absorption spectroscopy studies indicated that the incorporation of FLG between the α-Fe₂O₃ and TiO₂ layers resulted in reduced recombination in the α-Fe₂O₃ layer. The results showed that graphene intercalation improved the charge separation and the photocurrent density of the FTO/α-Fe₂O₃/FLG/TiO₂ system.
Organic Molecular Films as Light-Emitting and Light-Confining Material in Rolled-Up AlInP Semiconductor Microtube Resonators

A hybrid inorganic/organic microcavity system is presented in which an AlInP-based rolled-up microtube resonator is combined with a thin film of naphthyl end-capped bithiophene molecules. The film is laterally structured into stripes on top of the AlInP layer system before the roll-up process. During the process, the strained bilayer together with the organic molecular stripes rolls up, and a hybrid microtube is formed. The stripes act as visible-light emitters inside the otherwise passive microtube. Furthermore, they induce a light confinement in the axial direction of the microtube, additional to the radial and azimuthal confinement that is intrinsic to a microtube. As the organic material defines the cavity and represents the emitter at the same time, an efficient light coupling into the three-dimensionally confined optical modes of the microtube resonator is ensured. The hybrid microtubes open up the opportunity for novel experiments on the light–molecule interaction as well as their application in optical components.

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Photomechanical Energy Transfer to Photopassive Polymers through Hydrogen and Halogen Bonds

The supramolecular assembly of photoactive azobenzenes with passive polymers via halogen or hydrogen bonding is a cost-effective way to design materials for various photomechanical applications that convert light energy directly into macroscopic motion, for instance, in all-optical surface patterning and photochemical imaging of plasmonic structures. To elucidate the molecular-level origins of this motion, we show, by coupling dynamic infrared spectroscopy to a photo-orientation setup, that supramolecular bonds above a certain interaction strength threshold are photostable under vigorous photoisomerization cycling and capable of translating the photo-orientation of azobenzenes into the orientation of nonabsorbing host polymer side chains. A correlation is found between azobenzene photoinduced molecular orientation and macroscopic all-optical surface patterning efficiency. The improved performance of halogen-bonded systems in photopatterning applications can be related to the absence of a plasticizing effect on the polymer matrix, which may enable the material to retain an optimal glass transition temperature, in contrast to hydrogen-bonded and nonbonded references. Thus, our results provide design guidelines in terms of the nature and strength of the supramolecular interaction and of the degree of azo functionalization needed to optimize the motion transfer to passive polymers.

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Scopus rating (2014): SJR 2.534 SNIP 1.721 CiteScore 5.83
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Scopus rating (2012): SJR 2.779 SNIP 1.58 CiteScore 5.35
Scopus rating (2011): SJR 2.556 SNIP 1.593 CiteScore 5.15
Scopus rating (2010): SJR 2.51 SNIP 1.51
Scopus rating (2009): SJR 2.962 SNIP 1.533
Scopus rating (2008): SJR 2.819 SNIP 1.54
Scopus rating (2007): SJR 3.102 SNIP 1.613
Scopus rating (2006): SJR 2.987 SNIP 1.714
Scopus rating (2005): SJR 2.579 SNIP 1.654
Scopus rating (2004): SJR 2.606 SNIP 1.691
Scopus rating (2003): SJR 2.497 SNIP 1.635
Scopus rating (2002): SJR 2.793 SNIP 1.71
Scopus rating (2001): SJR 2.782 SNIP 1.745
Scopus rating (2000): SJR 2.631 SNIP 2.054
Scopus rating (1999): SJR 2.801 SNIP 2.014
Original language: English
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http://www.scopus.com/inward/record.url?scp=84945400553&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source-ID: 84945400553
Research output: Scientific - peer-review › Article
Changes in global gene expression of Vibrio parahaemolyticus induced by cold- and heat-stress

Background: Vibrio (V.) parahaemolyticus causes seafood-borne gastro-intestinal bacterial infections in humans worldwide. It is widely found in marine environments and is isolated frequently from seawater, estuarine waters, sediments and raw or insufficiently cooked seafood. Throughout the food chain, V. parahaemolyticus encounters different temperature conditions that might alter metabolism and pathogenicity of the bacterium. In this study, we performed gene expression profiling of V. parahaemolyticus RIMD 2210633 after exposure to 4, 15, 20, 37 and 42°C to describe the cold and heat shock response. Methods: Gene expression profiles of V. parahaemolyticus RIMD 2210633 after exposure to 4, 15, 20, 37 and 42°C were investigated via microarray. Gene expression values and RT-qPCR experiments were compared by plotting the log2 values. Moreover, volcano plots of microarray data were calculated to visualize the distribution of differentially expressed genes at individual temperatures and to assess hybridization qualities and comparability of data. Finally, enriched terms were searched in annotations as well as functional-related gene categories using the Database for Annotation, Visualization and Integrated Discovery. Results: Analysis of 37°C normalised transcriptomics data resulted in differential expression of 19 genes at 20°C, 193 genes at 4°C, 625 genes at 42°C and 638 genes at 15°C. Thus, the largest number of significantly expressed genes was observed at 15 and 42°C with 13.3 and 13 %, respectively. Genes of many functional categories were highly regulated even at lower temperatures. Virulence associated genes (tdh1, tdh2, toxR, toxS, vopC, T6SS-1, T6SS-2) remained mostly unaffected by heat or cold stress. Conclusion: Along with folding and temperature shock depending systems, an overall temperature-dependent regulation of expression could be shown. Particularly the energy metabolism was affected by changed temperatures. Whole-genome gene expression studies of food related pathogens such as V. parahaemolyticus reveal how these pathogens react to stress impacts to predict its behaviour under conditions like storage and transport.
Regenerative Astaxanthin Extraction from a Single Microalgal (Haematococcus pluvialis) Cell Using a Gold Nano-Scalpel

Milking of microalgae, the process of reusing the biomass for continuous production of target compounds, can strikingly overcome the time and cost constraints associated with biorefinery. This process can significantly improve production efficiency of highly valuable chemicals, for example, astaxanthin (AXT) from Haematococcus pluvialis. Detailed understanding of the biological process of cell survival and AXT reaccumulation after extraction would be of great help for successful milking. Here we report extraction of AXT from a single cell of H. pluvialis through incision of the cell wall by a gold nanoscalpel (Au-NS), which allows single-cell analysis of wound healing and reaccumulation of AXT. Interestingly, upon the Au-NS incision, the cell could reaccumulate AXT at a rate two times faster than the control cells. Efficient extraction as well as minimal cellular damage, keeping cells alive, could be achieved with the optimized shape and dimensions of Au-NS: a well-defined sharp tip, thickness under 300 nm, and 1-3 μm of width. The demonstration of regenerative extraction of AXT at a single cell level hints toward the potential of a milking process for continuous recovery of target compounds from microalgae while keeping the cells alive.
PEEK. The decreased stability was observed in the decomposition onset temperature after 8 d and in the melting point and the glass transition temperature after 32 d. The first signs of degradation, crosslinking, embrittlement, and reduced thermal stability, were visible roughly after 8 d of ageing, whereas the deterioration in general usability occurred after 64 d.

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Scopus rating (2014): SJR 1.278 SNIP 1.888 CiteScore 3.37
Scopus rating (2013): SJR 1.341 SNIP 2.12 CiteScore 3.35
Scopus rating (2012): SJR 1.423 SNIP 2.105 CiteScore 3.25
Scopus rating (2011): SJR 1.347 SNIP 2.099 CiteScore 3.17
Scopus rating (2010): SJR 1.237 SNIP 1.642
Scopus rating (2009): SJR 1.349 SNIP 1.623
Scopus rating (2008): SJR 1.281 SNIP 1.745
Scopus rating (2007): SJR 1.451 SNIP 1.557
Scopus rating (2006): SJR 1.367 SNIP 1.787
Scopus rating (2005): SJR 1.197 SNIP 1.461
Scopus rating (2004): SJR 1.062 SNIP 1.43
Scopus rating (2003): SJR 0.922 SNIP 1.24
Scopus rating (2002): SJR 0.821 SNIP 1.058
Scopus rating (2001): SJR 0.93 SNIP 1.151
Scopus rating (2000): SJR 0.685 SNIP 1.077
Scopus rating (1999): SJR 0.75 SNIP 1.194
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Source: Scopus
Source-ID: 84942433318
Research output: Scientific - peer-review › Article
Cultivation of Nannochloropsis for eicosapentaenoic acid production in wastewaters of pulp and paper industry

The eicosapentaenoic acid (EPA) containing marine microalga Nannochloropsis oculata was grown in an effluent from anaerobic digestion of excess activated sludge from a wastewater treatment plant serving a combination of a pulp and a paper mill and a municipality (digester effluent, DE), mixed with the effluent of the same wastewater treatment plant. The maximum specific growth rate and photosynthesis of N. oculata were similar in the DE medium and in artificial sea water medium (ASW) but after 7 days, algae grown in the DE medium contained seven times more triacylglycerols (TAGs) per cell than cells grown in ASW, indicating mild stress in the DE medium. However, the volumetric rate of EPA production was similar in the ASW and DE media. The results suggest that N. oculata could be used to produce EPA, utilizing the nutrients available after anaerobic digestion of excess activated sludge of a pulp and paper mill.

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Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Urban circular bioeconomy (UrCirBio), University of Turku, Department of Biochemistry/Molecular Plant Biology, Department of Biochemistry/Food Chemistry and Food Development
Authors: Polishchuk, A., Valev, D., Tarvainen, M., Mishra, S., Kinnunen, V., Antal, T., Yang, B., Rintala, J., Tyystjärvi, E.
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Scopus rating (2014): SJR 2.41 SNIP 2.104 CiteScore 5.3
Scopus rating (2013): SJR 2.412 SNIP 2.503 CiteScore 5.97
Scopus rating (2012): SJR 2.389 SNIP 2.465 CiteScore 5.25
Scopus rating (2011): SJR 2.314 SNIP 2.508 CiteScore 5.56
Scopus rating (2010): SJR 2.086 SNIP 2.355
Scopus rating (2009): SJR 1.912 SNIP 2.231
Scopus rating (2008): SJR 1.734 SNIP 2.732
Scopus rating (2007): SJR 1.529 SNIP 2.423
Scopus rating (2006): SJR 1.315 SNIP 1.98
Scopus rating (2005): SJR 1.269 SNIP 2.006
Scopus rating (2004): SJR 1.197 SNIP 1.659
Scopus rating (2003): SJR 0.948 SNIP 1.639
Scopus rating (2002): SJR 0.882 SNIP 1.3
Scopus rating (2001): SJR 0.541 SNIP 1.208
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ASJC Scopus subject areas: Bioengineering, Environmental Engineering, Waste Management and Disposal
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http://www.scopus.com/inward/record.url?scp=84936059366&partnerID=8YFLogxK (Link to publication in Scopus)
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Research output: Scientific › peer-review › Article

Measuring the green color of vegetables from digital images using image analysis

When analyzing the color of foods, a measurement device consisting of a digital camera and image analysis software is an attractive alternative to traditional instruments such as spectrophotometers, colorimeters and sensory evaluations. The
device enables the measuring of the surface of a sample pixel-by-pixel and offers versatile possibilities for new imaging-based analysis strategies for food research. Our objective was to evaluate if this apparatus could detect differences in colors existing in green vegetables. We showed that the device separated batches of green vegetables and detected color differences that existed in vegetables with different degrees of green color. We demonstrated that this device could measure the color change of green vegetables during heat treatments. We conclude that this experimental setup has the potential to evaluate the healthiness of a diet by analyzing the proportion and quality of green vegetables for use in a serving at a buffet table or dinner plate.

General information
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Organization: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Turun Yliopisto/Turun Biomateriaalikeskus, University of Oslo, Faculty of Medicine, 22.10.2010, University of Turku, Functional Foods Forum
Authors: Manninen, H., Paakki, M., Hopia, A., Franzén, R.
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- Scopus rating (2014): SJR 1.348 SNIP 1.8 CiteScore 3.12
- Scopus rating (2013): SJR 1.365 SNIP 1.824 CiteScore 3.11
- Scopus rating (2012): SJR 1.574 SNIP 2.013 CiteScore 3.12
- Scopus rating (2011): SJR 1.442 SNIP 1.877 CiteScore 3.18
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- Scopus rating (2008): SJR 1.087 SNIP 1.209
- Scopus rating (2007): SJR 0.874 SNIP 1.21
- Scopus rating (2006): SJR 0.767 SNIP 1.204
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- Scopus rating (2004): SJR 0.603 SNIP 0.834
- Scopus rating (2003): SJR 0.503 SNIP 0.923
- Scopus rating (2002): SJR 0.535 SNIP 0.942
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Research output: Scientific - peer-review Article

Effects of anode potentials on bioelectrogenic conversion of xylose and microbial community compositions

The results on the effects of different anode potentials on current densities, coulombic efficiencies and microbial communities are contradictory and have not been studied with xylose, an important constituent of lignocellulosic materials. In this study, the effects of different anode potentials (+0.2, 0 and -0.2V vs. Ag/AgCl) on current generation, xylose degradation and microbial communities were examined with an exoelectrogenic enrichment culture originating from anaerobic sludge. Anode potential of +0.2V (vs. Ag/AgCl) resulted in the highest current density and coulombic efficiency
of 1.5±0.2A/m² and 62±11%, respectively, and there was no accumulation of soluble metabolites. With anode potentials of 0 and -0.2V the current densities remained low and acetate, butyrate and propionate were detected in the end of batch runs. Different anode potentials resulted in substantial differences in the anodic bacterial species. At more positive anode potentials, Ochrobactrum intermedium reported to be capable of direct electron transfer dominated. At more negative anode potentials, a known mediator-producer, Alcaligenes faecalis, and Desulfitobacterium hafniense, that has been reported to use mediated electron transfer, were detected. This study shows that the anode potential has a substantial effect on microbial communities and on xylose metabolism.

Measuring synthesis yield in graphene oxide synthesis by modified hummers method

Synthesis of graphene oxide by the modified Hummers method and measuring the synthesis yield were investigated. Based on the results, a comprehensive method to measure graphene oxide synthesis yield was proposed, which will allow comparison of future literature results. In addition, changes are proposed to the exfoliation procedure to improve the yield of the modified Hummers synthesis. With the proposed method, systematic error of the concentration measurement was calculated to be ±0.08 × 10⁻³ g mL⁻¹. In addition, changes proposed to the graphene oxide exfoliation process can improve the synthesis yield by up to 70%.
Gene expression profiles of *Vibrio parahaemolyticus* in the early stationary phase

*Vibrio (V.) parahaemolyticus* is an aquatic bacterium capable of causing foodborne gastroenteritis. In the environment or the food chain, *V. parahaemolyticus* cells are usually forced into the stationary phase, the common phase for bacterial survival in the environment. So far, little is known about whole genomic expression of *V. parahaemolyticus* in the early stationary phase compared with the exponential growth phase. We performed whole transcriptomic profiling of *V. parahaemolyticus* cells in both phases (exponential and early stationary phase). Our data showed in total that 172 genes were induced in early stationary phase, while 61 genes were repressed in early stationary phase compared with the exponential phase. Three functional categories showed stable gene expression in the early stationary phase. Eleven
functional categories showed that up-regulation of genes was dominant over down-regulation in the early stationary phase. Although genes related to endogenous metabolism were repressed in the early stationary phase, massive regulation of gene expression occurred in the early stationary phase, indicating the expressed gene set of V. parahaemolyticus in the early stationary phase impacts environmental survival.

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Scopus rating (2012): SJR 0.705 SNIP 0.956 CiteScore 1.92
Scopus rating (2011): SJR 0.747 SNIP 0.921 CiteScore 1.87
Scopus rating (2010): SJR 0.693 SNIP 0.794
Scopus rating (2009): SJR 0.741 SNIP 0.871
Scopus rating (2008): SJR 0.759 SNIP 0.881
Scopus rating (2007): SJR 0.746 SNIP 0.875
Scopus rating (2006): SJR 0.786 SNIP 0.938
Scopus rating (2005): SJR 0.73 SNIP 0.924
Scopus rating (2004): SJR 0.799 SNIP 0.91
Scopus rating (2003): SJR 0.701 SNIP 0.896
Scopus rating (2002): SJR 0.641 SNIP 0.898
Scopus rating (2001): SJR 0.673 SNIP 0.927
Scopus rating (2000): SJR 0.631 SNIP 0.842
Scopus rating (1999): SJR 0.785 SNIP 0.965
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Research output: Scientific - peer-review › Article

Searching for a robust strategy for minimizing alkali chlorides in fluidized bed boilers during burning of high SRF-energy-share fuel
To meet the increasing volume of waste to be treated via energy recovery, high SRF-energy-share fuel is being fired in conventional waste-to-energy facilities. In this work, corrosion related risk during firing of 70 e-% share (target fuel) is studied and compared against the base case fuel containing 50 e-% share. Cl and S concentration is highest in the target fuel as a direct result of increasing the proportion of SRF in the fuel mixture. Br, Zn and Pb showed the same trend. Meanwhile, the concentration of Na, K, Al and Si are highly dependent on the type of the SRF fired. The corrosion risk of the base and target fuels are analyzed using the composition of the fine aerosol fraction and deposit samples measured near the vicinity of the superheater. Surprisingly aerosols for the target fuel are less risky - having less Cl and more S,
than that of the base fuel. The effects of sulfur based additives - elemental sulfur and sulfate injection, and fuel substitution on the risk of superheater corrosion are likewise analyzed. All these strategies can reduce the concentration of Cl in the aerosols, however it is concluded that sulfate injection is considered as a robust strategy for mitigating alkali chloride formation. Sulfate injection is able to reduce Cl in the aerosols and deposits regardless of the quality of the fuel mixture. Robust strategies are important in ensuring the boiler performance during high SRF-energy share firing. An attempt of linking the quality of the deposits and the properties of the flue gas and aerosols around the superheater using partial least squares regression is also presented.

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Authors: Bajamundi, C. J. E., Vainikka, P., Hedman, M., Silvennoinen, J., Heinanen, T., Taipale, R., Konttinen, J.
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Scopus rating (2014): SJR 1.667 SNIP 2.331 CiteScore 4.14
Scopus rating (2013): SJR 1.811 SNIP 2.595 CiteScore 4.31
Scopus rating (2012): SJR 1.852 SNIP 2.465 CiteScore 3.99
Scopus rating (2011): SJR 2.093 SNIP 2.427 CiteScore 4.1
Scopus rating (2010): SJR 1.984 SNIP 2.319
Scopus rating (2009): SJR 2.012 SNIP 2.277
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Scopus rating (2007): SJR 1.383 SNIP 1.86
Scopus rating (2006): SJR 1.278 SNIP 1.64
Scopus rating (2005): SJR 1.623 SNIP 1.73
Scopus rating (2004): SJR 1.273 SNIP 1.883
Scopus rating (2003): SJR 1.103 SNIP 1.481
Scopus rating (2002): SJR 1.13 SNIP 1.301
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Scopus rating (2000): SJR 1.047 SNIP 1.272
Scopus rating (1999): SJR 1.117 SNIP 1.157
Original language: English
ASJC Scopus subject areas: Fuel Technology, Energy Engineering and Power Technology, Chemical Engineering(all), Organic Chemistry
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Research output: Scientific - peer-review › Article

Fe2O3-TiO2 nanosystems by a hybrid PE-CVD/ALD approach: controllable synthesis, growth mechanism, and photocatalytic properties
Supported Fe2O3-TiO2 nanocomposites are fabricated by an original vapor phase synthetic strategy, consisting of the initial growth of Fe2O3 nanosystems on fluorine-doped tin oxide substrates by plasma enhanced-chemical vapor deposition, followed by atomic layer deposition of TiO2 overlayers with variable thickness, and final thermal treatment in air. A thorough characterization of the target systems is carried out by X-ray diffraction, atomic force microscopy, field emission-scanning electron microscopy, energy dispersive X-ray spectroscopy, transmission electron microscopy, and X-
ray photoelectron spectroscopy. High purity nanomaterials characterized by the co-presence of Fe2O3 (hematite) and TiO2 (anatase), with an intimate Fe2O3-TiO2 contact, are successfully obtained. In addition, photocatalytic tests demonstrate that, whereas both single-phase oxides do not show appreciable activity, the composite systems are able to degrade methyl orange aqueous solutions under simulated solar light, and even visible light, with an efficiency directly dependent on TiO2 overlayer thickness. This finding opens attractive perspectives for eventual applications in wastewater treatment.

Fluorescent Protein Based FRET Pairs with Improved Dynamic Range for Fluorescence Lifetime Measurements

Fluorescence Resonance Energy Transfer (FRET) using fluorescent protein variants is widely used to study biochemical processes in living cells. FRET detection by fluorescence lifetime measurements is the most direct and robust method to measure FRET. The traditional cyan-yellow fluorescent protein based FRET pairs are getting replaced by green-red fluorescent protein variants. The green-red pair enables excitation at a longer wavelength which reduces cellular autofluorescence and phototoxicity while monitoring FRET. Despite the advances in FRET based sensors, the low FRET efficiency and dynamic range still complicates their use in cell biology and high throughput screening. In this paper, we utilized the higher lifetime of NowGFP and screened red fluorescent protein variants to develop FRET pairs with high...
dynamic range and FRET efficiency. The FRET variations were analyzed by proteolytic activity and detected by steady-state and time-resolved measurements. Based on the results, NowGFP-tdTomato and NowGFP-mRuby2 have shown high potentials as FRET pairs with large fluorescence lifetime dynamic range. The in vitro measurements revealed that the NowGFP-tdTomato has the highest Forster radius for any fluorescent protein based FRET pairs yet used in biological studies. The developed FRET pairs will be useful for designing FRET based sensors and studies employing Fluorescence Lifetime Imaging Microscopy (FLIM).

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Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Research group: Industrial Bioengineering and Applied Organic Chemistry, Frontier Photonics, Urban circular bioeconomy (UrCirBio)
Authors: George Abraham, B., Sarkisyan, K. S., Mishin, A. S., Santala, V., Tkachenko, N. V., Karp, M.
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Scopus rating (2014): SJR 1.545 SNIP 1.141 CiteScore 3.54
Scopus rating (2013): SJR 1.74 SNIP 1.147 CiteScore 3.94
Scopus rating (2012): SJR 1.945 SNIP 1.142 CiteScore 4.15
Scopus rating (2011): SJR 2.369 SNIP 1.23 CiteScore 4.58
Scopus rating (2010): SJR 2.631 SNIP 1.161
Scopus rating (2009): SJR 2.473 SNIP 0.985
Scopus rating (2008): SJR 2.323 SNIP 0.96
Scopus rating (2007): SJR 1.289 SNIP 0.525
Original language: English
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Source-ID: 000358942400027
Research output: Scientific - peer-review Article

Photoinduced Electron Transfer in CdSe/ZnS Quantum Dot-Fullerene Hybrids
Photoinduced electron transfer (ET) in CdSe/ZnS core-shell quantum dot (QD) - fullerene (COOH-C<inf>60</inf>) hybrids was studied by the means of time-resolved emission and absorption spectroscopy techniques. A series of four QDs with emission in the range 540-630 nm was employed to investigate the dependence of the electron transfer rate on the QD size. Emission of the QDs is quenched upon hybrid formation, and the quenching mechanism is identified as photoinduced electron transfer from the QD to the fullerene moiety due to the fullerene anion signature observed in transient absorption. In order to obtain quantitative information on the ET reaction, several kinetic data analysis techniques were used, including a conventional multiexponential fitting and a maximum entropy method for emission decay analysis, as well as a distributed decay model based on the Poisson distribution of fullerenes in the hybrids. The latter gradually simplifies the interpretation of the transient absorption spectra and indicates that the spectra of QD cations are essentially similar to those of neutral QDs, differing only by a minor decrease in the intensity and broadening. Furthermore, only a minor decrease in the ET rate with the increasing QD size was observed, the time constants being in the range 100-200 ps for all studied QDs. The charge recombination is extended to 10 ns or longer for all hybrids.

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Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Virkki, K., Demir, S., Lemmetyinen, H., Tkachenko, N. V.
Subpicosecond to Second Time-Scale Charge Carrier Kinetics in Hematite-Titania Nanocomposite Photoanodes

Water splitting with hematite is negatively affected by poor intrinsic charge transport properties. However, they can be modified by forming heterojunctions to improve charge separation. For this purpose, charge dynamics of TiO₂:α-Fe₂O₃ nanocomposite photoanodes are studied using transient absorption spectroscopy to monitor the evolution of photogenerated charge carriers as a function of applied bias voltage. The bias affects the charge carrier dynamics, leading to trapped electrons in the submillisecond time scale and an accumulation of holes with a lifetime of 0.4 +/- 0.1 s. By contrast, slower electron trapping and only few long-lived holes are observed in a bare hematite photoanode. The decay of the long-lived holes is 1 order of magnitude faster for the composite photoanodes than previously published for doped hematite, indicative of higher catalytic efficiency. These results illustrate the advantages of using composite materials to overcome poor charge carrier dynamics, leading to a 30-fold enhancement in photocurrent.

General information

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Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Tampere University of Technology, Department of Materials Engineering, Frontier Photonics, ETH Zürich, Laboratory for Multifunctional Materials
Authors: Ruoko, T. P., Kaunisto, K., Bärtsch, M., Pohjola, J., Hiltunen, A., Niederberger, M., Tkachenko, N. V., Lemmetynen, H.
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Synthesis and study of electrochemical and optical properties of substituted perylenemonoimides in solutions and on solid surfaces

A new and efficient methodology towards the synthesis of 7-pyrrolidinyl and 7,12-bispyrrolidinyl perylenemonoimide monoanhydrides (PMI monoanhydrides) and their corresponding dicarboxylic acids is devised. The high yields (70-96%) and facile synthesis of PMI monoanhydrides, as compared to traditional methodologies, make the method attractive and versatile. The reported 7,12-bispyrrolidinyl PMI monoanhydrides are a new family of peryleneimides, where both the bay-substituents are located towards the anhydride cycle. The electrochemical and optical properties of target molecules and their precursors were investigated using UV-Vis spectroscopy and differential pulse voltammetry. Atomic charges and electronic properties were calculated using density functional theory (DFT). In addition, self-assembling monolayers of the PMI monoanhydrides and their corresponding diacids were successfully formed over ZnO and TiO$_2$ films. The results of the current study indicate that these molecules are potentially good candidates for various applications in the fields of organic electronics and solar cells.
A comparison of rheology and FTIR in the study of polypropylene and polystyrene photodegradation

Rheology and FTIR spectroscopy are compared as methods to study the degree of photodegradation in polypropylene (PP) and polystyrene (PS) sheets. The materials are hot pressed, artificially photo-aged with fluorescent lights for 4-2048 h and then measured with a rotational rheometer and FTIR. Both materials show a tendency for chain scission which can be seen as a reduction in viscosity. Changes in PP can be observed with both methods after 256 h of irradiation. Changes in PS become significant in rheology after 64 h but in FTIR only after 1024 h of irradiation. Due to the different chemical nature of the materials, the degradation of PS is rather linear with exposure, whereas the degradation of PP is more exponential. Using the zero shear viscosities obtained through extrapolations of the Cole-Cole and Carreau-Yasuda models, relative molecular weights are estimated with the aid of the power-law relationship between these two. These results are compared with the carbonyl indices determined from the FTIR spectra. Rheology is found to be a viable alternative for FTIR in certain situations.
Molecular interactions on single-walled carbon nanotubes revealed by high-resolution transmission microscopy

The close solid-state structure-property relationships of organic pi - aromatic molecules have attracted interest due to their implications for the design of organic functional materials. In particular, a dimeric structure, that is, a unit consisting of two molecules, is required for precisely evaluating intermolecular interactions. Here, we show that the sidewall of a singlewalled carbon nanotube (SWNT) represents a unique molecular dimer platform that can be directly visualized using high-resolution transmission electron microscopy. Pyrene is chosen as the pi - aromatic molecule; its dimer is covalently linked to the SWNT sidewalls by aryl addition. Reflecting the orientation and separation of the two molecules, the pyrene dimer on the SWNT exhibits characteristic optical and photophysical properties. The methodology discussed here-form and probe molecular dimers-is highly promising for the creation of unique models and provides indispensable and fundamental information regarding molecular interactions.
ultrafast time-resolved spectroscopic methods revealed the subpicosecond formation of two types of primary short-living (1-18 ps) intramolecular exciplexes, which relaxed in toluene to form a long-living final exciplex (1.4 ns) followed by a longer-living charge transfer complex (>5 ns). However, in benzonitrile, the lifetime of the final exciplex was longer (660 ps) as was that of the charge transfer complex (180 ps). The β-β analogue formed similar short-living exciplexes in both solvents, but the final exciplex and the charge transfer state had significantly shorter lifetimes. The electrochemical redox potential measurements and density functional theory calculations supported the proposed mechanism.

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Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics, Tampere Graduate School in Science and Engineering (TISE), Kyoto Women's University, Department of Molecular Engineering, Graduate School of Engineering, Institute for Integrated Cell-Material Sciences (WPI-iCeMS), Kyoto University, Kyushu University, Niigata University

Authors: Abou-Chahine, F., Fujii, D., Imahori, H., Nakano, H., Tkachenko, N. V., Matano, Y., Lemmetyinen, H.

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Scopus rating (2013): SJR 1.494 SNIP 1.2 CiteScore 3.53
Scopus rating (2012): SJR 1.92 SNIP 1.251 CiteScore 3.66
Scopus rating (2011): SJR 1.78 SNIP 1.226 CiteScore 3.62
Scopus rating (2010): SJR 1.849 SNIP 1.214
Scopus rating (2009): SJR 2.232 SNIP 1.349
Scopus rating (2008): SJR 2.543 SNIP 1.381
Scopus rating (2007): SJR 2.346 SNIP 1.282
Scopus rating (2006): SJR 2.369 SNIP 1.415
Scopus rating (2005): SJR 2.275 SNIP 1.474
Scopus rating (2004): SJR 2.148 SNIP 1.511
Scopus rating (2003): SJR 2.034 SNIP 1.47
Scopus rating (2002): SJR 2.118 SNIP 1.496
Scopus rating (2001): SJR 2.053 SNIP 1.508
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Research output: Scientific - peer-review › Article

**Catalytic effect of Ca and K on CO2 gasification of spruce wood char**

Gasification is one route to produce chemicals and liquid fuels from biomass. The gasification of the char is catalyzed by alkaline and alkaline earth metals in the biomass. In this work the catalytic effect of calcium (Ca) and potassium (K) on CO2 gasification of spruce wood was studied using a thermo gravimetric analyzer (TGA). The ash-forming elements were first removed from the wood using an acid leaching method. Then, various concentrations of K and Ca were absorbed to the wood by ion-exchange to carboxylic and phenolic groups, impregnation of K2CO3 or physically mixing of CaC2O4. The prepared spruce samples were placed in a mesh holder and gasified in the TGA at 850°C in 100% CO2. The results
demonstrate that the gasification rate of the char increased linearly with an increase in the concentration of Ca or K. Crystalline CaC2O4 distributed only at the surface of the wood particles resulted in low catalytic activity. The catalytic activity of Ca was higher than K in the beginning of char gasification but the catalytic effect of Ca decreased earlier than the catalytic effect of potassium. Further, the char structure was investigated by SEM-EDX. The SEM analysis from interrupted gasification experiments showed the formation of CaCO3 and K2CO3 layer on the char surface. By adding corresponding levels of Ca and K as the original spruce to the acid washed sample, a similar gasification reactivity was obtained at 850 °C.

Polymorph crystal packing effects on charge transfer emission in the solid state
Condensation of 1,8-naphthalic anhydride with N,N-(dimethylamino)aniline produced the donor-acceptor compound DMIM, which crystallised from a chloroform-diethyl ether mixture to afford two different coloured crystal polymorphs. Crystals for one polymorph are small and green, whereas the other crystals are orange and needle-like. X-ray crystal structures for both polymorphs were determined. The donor N,N-dimethylaniline and acceptor naphthalimide groups are twisted with respect to each other; the degree of twist is marginally different for the two structures. The orange crystal
polymorph crystallises in the monoclinic space group C2/c and contains two slightly different molecular conformers in the unit cell (calculated density is 1.410 g cm<sup>-3</sup>). The green crystal polymorph crystallises in the triclinic space group P1 and contains only one type of molecule in the unit cell (calculated density is 1.401 g cm<sup>-3</sup>). The crystal packing motifs for the two polymorphs are subtly different, explaining the small variance in the observed densities. Very weak room temperature emission was observed for DMIM in a CHCl<sub>3</sub> solution, but crystals deposited on a glass slide glowed when irradiated at 488 nm using a fluorescence microscope. Disparate solid-state emission spectra and lifetimes for the two polymorphic crystal forms are observed for the dyad. The emission is assigned to charge recombination fluorescence from a charge transfer state. This journal is

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Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Molecular Photonics Laboratory, School of Chemistry, Newcastle University, United Kingdom, University of Malta
Authors: He, X., Benniston, A. C., Saarenpää, H., Lemmetyinen, H., Tkachenko, N. V., Baisch, U.
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Scopus rating (2016): SJR 4.475 SNIP 1.67 CiteScore 8.44
Scopus rating (2015): SJR 4.74 SNIP 1.749 CiteScore 9.13
Scopus rating (2014): SJR 4.991 SNIP 1.745 CiteScore 8.99
Scopus rating (2013): SJR 4.675 SNIP 1.587 CiteScore 8.44
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Research output: Scientific - peer-review › Article

Laser-pointer-induced self-focusing effect in hybrid-aligned dye-doped liquid crystals
Nonlinear optics deals with phenomena where "light controls light"; e.g., there is mediation by an intensity-dependent medium through which light propagates. This field has attracted much attention for its immense potential in applications dependent on nonlinear processes, such as frequency conversion, multiple-photon absorption, self-phase modulation, and so on. However, such nonlinearities are typically only observed at very high light intensities and thus they require costly lasers. Here, we report on a self-focusing effect induced with a 1 mW handheld laser pointer. We prepared polymer-stabilized dye-doped liquid crystals, in which the molecular director orientation gradually changes from homeotropic at one surface to homogeneous at the other. This is referred to as hybrid alignment. In such films, the threshold intensity needed to form diffraction rings was reduced by a factor of 8.5 compared to that in conventional homeotropic cells, which enabled the induction of the self-focusing effect with a laser pointer.

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Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics, Tokyo Inst Technol, Tokyo Institute of Technology, Chem Resources Lab, Midori Ku, JST, Japan Science & Technology Agency (JST), PRESTO
Authors: Wang, J., Aihara, Y., Kinoshita, M., Mamiya, J., Priimagi, A., Shishido, A.
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Biomimetic collagen I and IV double layer Langmuir-Schaefer films as microenvironment for human pluripotent stem cell derived retinal pigment epithelial cells

The environmental cues received by the cells from synthetic substrates in vitro are very different from those they receive in vivo. In this study, we applied the Langmuir-Schaefer (LS) deposition, a variant of Langmuir-Blodgett technique, to fabricate a biomimetic microenvironment mimicking the structure and organization of native Bruch's membrane for the production of the functional human embryonic stem cell derived retinal pigment epithelial (hESC-RPE) cells. Surface pressure-area isotherms were measured simultaneously with Brewster angle microscopy to investigate the self-assembly of human collagens type I and IV on air-subphase interface. Furthermore, the structure of the prepared collagen LS films was characterized with scanning electron microscopy, atomic force microscopy, surface plasmon resonance measurements and immunofluorescent staining. The integrity of hESC-RPE on double layer LS films was investigated by measuring transepithelial resistance and permeability of small molecular weight substance. Maturation and functionality of hESC-RPE cells on double layer collagen LS films was further assessed by RPE-specific gene and protein expression, growth factor secretion, and phagocytic activity. Here, we demonstrated that the prepared collagen LS films have layered structure with oriented fibers corresponding to architecture of the uppermost layers of Bruch's membrane and result in increased barrier properties and functionality of hESC-RPE cells as compared to the commonly used dip-coated controls.
Gene expression profiles of *Vibrio parahaemolyticus* in viable but non-culturable state

Viable but non-culturable (VBNC) state is referred to as a dormant state of non-sporulating bacteria enhancing the survival in adverse environments. To our knowledge, only few studies have been conducted on whole genomic expression of *Vibrio parahaemolyticus* VBNC state. Since a degradation of nucleic acids in *V. vulnificus* non-culturable state has been detected, we hypothesize that gene regulation of VBNC cells is highly reduced, downregulation of gene expression is dominant and only metabolics functions crucial for survival are kept on a sustained basis. Hence, we performed the whole transcriptomic profiles of *V. parahaemolyticus* in three phases (exponential, early stationary phase and VBNC state). Compared with exponential and early stationary phase, in *V. parahaemolyticus* VBNC cells we found 509 induced genes and 309 repressed by more than 4-fold among 4820 investigated genes. Upregulation was dominant in most of non-metabolism functional categories, while five metabolism-related functional categories revealed downregulation in VBNC state. To our knowledge, this is the first study of comprehensive transcriptomic analyses of three phases of *V. parahaemolyticus* RIMD2210633. Although the mechanism of VBNC state is not yet clear, massive regulation of gene expression occurs in VBNC state compared with expression in other two phases, indicating VBNC cells are active.

General information

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**Organisations:** Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Free Univ Berlin, Free University of Berlin, Inst Food Hyg  
**Authors:** Meng, L., Alter, T., Aho, T., Huehn, S.  
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**Ratings:**  
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Scopus rating (2014): SJR 1.564 SNIP 1.239 CiteScore 3.8  
Scopus rating (2013): SJR 1.656 SNIP 1.294 CiteScore 4.15  
Scopus rating (2012): SJR 1.668 SNIP 1.21 CiteScore 3.78  
Scopus rating (2011): SJR 1.638 SNIP 1.174 CiteScore 3.63
Light induced cytosolic drug delivery from liposomes with gold nanoparticles

Externally triggered drug release at defined targets allows site- and time-controlled drug treatment regimens. We have developed liposomal drug carriers with encapsulated gold nanoparticles for triggered drug release. Light energy is converted to heat in the gold nanoparticles and released to the lipid bilayers. Localized temperature increase renders liposomal bilayers to be leaky and triggers drug release. The aim of this study was to develop a drug releasing system capable of releasing its cargo to cell cytosol upon triggering with visible and near infrared light signals. The liposomes were formulated using either heat-sensitive or heat- and pH-sensitive lipid compositions with star or rod shaped gold nanoparticles. Encapsulated fluorescent probe, calcein, was released from the liposomes after exposure to the light. In addition, the pH-sensitive formulations showed a faster drug release in acidic conditions than in neutral conditions. The liposomes were internalized into human retinal pigment epithelial cells (ARPE-19) and human umbilical vein endothelial cells (HUVECs) and did not show any cellular toxicity. The light induced cytosolic delivery of calcein from the gold nanoparticle containing liposomes was shown, whereas no cytosolic release was seen without light induction or without gold nanoparticles in the liposomes. The light activated liposome formulations showed a controlled content release to the cellular cytosol at a specific location and time. Triggering with visual and near infrared light allows good tissue penetration and safety, and the pH-sensitive liposomes may enable selective drug release in the intracellular acidic compartments (endosomes, lysosomes). Thus, light activated liposomes with gold nanoparticles are an attractive option for time- and site-specific drug delivery into the target cells. (C) 2015 Elsevier B.V. All rights reserved.

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Crystal structure of 2-methylpiperazine-1,4-dilium bis(hydrogen maleate)

In the title salt, C\textsubscript{5}H\textsubscript{14}N\textsubscript{2}\textsuperscript{2+}·2C\textsubscript{4}H\textsubscript{3}O\textsubscript{4}\textsuperscript{-}, the asymmetric unit contains two independent 2-methylpiperazinium dications, which comprise a racemic pair, and four hydrogen maleate monoanions. In the roughly planar hydrogen maleate anions, intramolecular O-H⋯O hydrogen bonds generate S(7) rings. In the crystal, the four independent anions are linked to the 2-methylpiperazinium cations through N-H⋯O hydrogen bonds, forming two-dimensional layered structures lying parallel to (001).
Photocurrent Generation and Charge Recombination in Multilayer Stacks of Hole Transporting Layer, Electron Donor-Acceptor Dyad and Electron Transporting Layer

The processes of charge generation, transport, and recombination are the main characteristics in organic photovoltaic systems. The triple layer structures, consisted of a primary electron donor layer (poly(3-hexylthiophene), P3HT), an electron acceptor layer (perylenediimide, PDI), and covalently linked porphyrin fullerene donor acceptor dyad (D-A) layer (free base or Zn-porphyrin-fullerene dyad) were studied in this work by using a transient photocurrent method to monitor the electrical response in millisecond and second time scales. The active layers were in between two electrodes, which were insulated from them by several non-conductive octadecylamine films. Kinetics of charge generation, transport, and recombination was studied by monitoring light intensity dependent lifetimes of photocurrent signals. Both the signal intensities and lifetimes were increased by two orders of magnitude in the complete devices, H-(D-A)-E (or H vertical bar D-A vertical bar E), compared to the reference structures, H-(D-A) or (DA)-A (or H vertical bar D-A and D-A vertical bar E), evidencing efficient charge separation in the triple layer. Relative yields for the charge separation were calculated from the excitation intensity dependent photocurrent lifetimes, according to a simple three state model. Recombination of the steady states in darkness followed second order kinetics. In the complete device with Zn-porphyrin dyad the longer lifetimes and lower quantum yields for the charge separation and recombination rates were observed, indicating a charge trapping inside the layers instead of complete separation.

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Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Russian Acad Sci, Russian Academy of Sciences, Inst Gen Phys
Authors: Alekseev, A. S., Lemmetyinen, H., Tolkki, A.
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Scopus rating (2014): SJR 0.171 SNIP 0.352 CiteScore 0.5
Scopus rating (2013): SJR 0.183 SNIP 0.21 CiteScore 0.36
Scopus rating (2012): SJR 0.269 SNIP 0.381 CiteScore 0.52
Scopus rating (2011): SJR 0.38 SNIP 0.548 CiteScore 0.82
Scopus rating (2010): SJR 0.578 SNIP 0.45
Scopus rating (2009): SJR 0.679 SNIP 0.786
Scopus rating (2008): SJR 0.644 SNIP 0.939
Scopus rating (2007): SJR 0.335 SNIP 0.508
Original language: English
Encapsulation of secondary and tertiary ammonium salts by resorcinarenes and pyrogallarenes: The effect of size and charge concentration

The binding of different categories of alkyl ammonium (secondary and tertiary mono- and di-ammonium) salts with resorcinarenes and a pyrogallarene through weak interactions was analysed in all phases. 1H NMR spectroscopy and electrospray ionisation mass spectrometry were utilized in analysing the complexes in solution and in the gas phase, respectively. The 1H NMR titration studies in methanol-d4 reveal that the association constants for the 1:1 complexes vary according to the electronic properties of the hosts as well as the size, geometric orientation and charge concentration of the guest cations with binding constants of up to 950 M⁻¹ in some cases. Mass spectrometry reveals 1:1 monomeric and 1:2 dimeric complexes in the gas phase. Six co-crystals, three of which are dimeric host-guest capsule assemblies, two open inclusion complexes and a pseudocapsular methanol solvate, were analysed in the solid state through single-crystal X-ray diffraction. The crystal structures confirm that the complexes are held together by multiple cation⋯π, CH⋯π and hydrogen bond interactions.
Integrated in vitro-in silico screening strategy for the discovery of antibacterial compounds

Multidrug-resistant bacterial infections are an increasing source of healthcare problems, and the research for new antibiotics is currently unable to respond to this challenge. In this work, we present a screening strategy that integrates cell-based high-throughput screening (HTS) with in silico analogue search for antimicrobial small-molecule drug discovery. We performed an HTS on a diverse chemical library by using an assay based on a bioluminescent Escherichia coli K-12 (pTetLux1) strain. The HTS yielded eight hit compounds with >50% inhibition. These hits were then used for structural similarity-based virtual screening, and of the 29 analogues selected for in vitro testing, four compounds displayed potential activity in the pTetLux1 assay. The 11 most active compounds from combined HTS and analogue search were further assessed for antimicrobial activity against clinically important strains of E. coli and Staphylococcus aureus and for in vitro cytotoxicity against human cells. Additionally, two compounds of the set fully inhibited S. aureus growth after 24 h, but also exhibited human cell cytotoxicity in vitro.

Glycerol as an Efficient Medium for the Petasis Borono-Mannich Reaction

The multicomponent Petasis borono-Mannich (PBM) reaction is a useful tool for the preparation of complex molecules in a single step from boronic acids, aldehydes/ketones, and amines. Here, we describe the use of glycerol in the PBM reaction...
of salicylaldehydes or 2-pyridinecarbaldehyde with several boronic acids and secondary amines. From these readily available starting materials, alkylaminophenols, 2-substituted pyridines, and 2H-chromenes were prepared in reasonable to good yields. Glycerol was compared with other solvents, and in some cases, it provided the reaction product in higher yield. Crude glycerol, as generated by the biodiesel industry, was evaluated and found to be a suitable solvent for the PBM reaction, successfully expanding the potential use of this industry by-product. Based on density functional theory (DFT) calculations and the obtained experimental results, the involvement of glycerol-derived boronic esters in the reaction mechanism is suggested to be competitive with the free boronic acid pathway. Similar Gibbs free energies for the aryl migration from the boronate species to the iminium were determined for both mechanisms.

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Bibliographical note
AUX=orc,"Rosholm, Tomi"
Source: WOS
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Supramolecular hierarchy among halogen and hydrogen bond donors in light-induced surface patterning
Halogen bonding, a noncovalent interaction possessing several unique features compared to the more familiar hydrogen bonding, is emerging as a powerful tool in functional materials design. Herein, we unambiguously show that one of these characteristic features, namely high directionality, renders halogen bonding the interaction of choice when developing azobenzene-containing supramolecular polymers for light-induced surface patterning. The study is conducted by using an extensive library of azobenzene molecules that differ only in terms of the bond-donor unit. We introduce a new tetrafluorophenol-containing azobenzene photoswitch capable of forming strong hydrogen bonds, and show that an iodoethyl-containing azobenzene comes out on top of the supramolecular hierarchy to provide unprecedented photoinduced surface patterning efficiency. Specifically, the iodoethyl motif seems highly promising in future development of polymeric optical and photoactive materials driven by halogen bonding.

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Number of pages: 10
Pages: 759-768
Photophysical Study of a Self-Assembled Donor-Acceptor Two-Layer Film on TiO2

The self-assembled monolayer (SAM) technique was employed to fabricate a two-layer donor-acceptor film on the surface of TiO2. The approach is based on using donor and acceptor compounds with anchoring groups of different lengths. The acceptor, a fullerene derivative, has a carboxyl anchor attached to the fullerene moiety via a short linker that places the fullerene close to the surface. The donor, a porphyrin derivative, is equipped with a long linker that can penetrate between the fullerenes and keep porphyrin on top of the fullerene layer. The two-layer fullerene-porphyrin structures were deposited on a mesoporous film of TiO2 nanoparticles by immersing the TiO2 film sequentially into fullerene and porphyrin solutions. Transient absorption spectroscopy studies of the samples revealed that after the selective photoexcitation of porphyrin a fast (...

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Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics, Tampere Univ Technol, Tampere University of Technology, Dept Chem & Bioengn
Authors: Stranius, K., George, L., Efimov, A., Ruoko, T., Pohjola, J., Tkachenko, N. V.
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Controlled Regioselective Amination of Peryleneimides

Perylenedimides (PDIs) and perylenemonoimide diesters (PMIs) can be selectively substituted at the 1,6- or 7,12-positions of the bay region, respectively, by direct amination reactions. The reactions proceed by the formation of a perylene radical anion and its subsequent oxidation, and the yields range from 20-97%. The amination can be tuned to obtain either mono- or disubstituted perylenes by varying the oxidants involved. The presence of the imide cycle is crucial for the transformation, although the amination occurs regioselectively at the bay-region positions distant from the imide cycle.

General information

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Scopus rating (2010): SJR 1.572 SNIP 0.785
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Scopus rating (2008): SJR 1.652 SNIP 0.759
Scopus rating (2007): SJR 1.711 SNIP 0.84
Scopus rating (2006): SJR 1.505 SNIP 0.849
Scopus rating (2005): SJR 1.246 SNIP 0.763
Scopus rating (2004): SJR 1.2 SNIP 0.81
Aryl end-capped quaterthiophenes applied as anode interfacial layers in inverted organic solar cells

Four aryl end-capped quaterthiophene derivatives were synthesized and their material properties were studied by computational, spectroscopic, electrochemical, and thermoanalytical methods. Compounds were applied as interfacial layers between the bulk heterojunction active layer and Ag anode in inverted organic solar cells. Results show that p-cyanophenyl end-capped quaterthiophene with hexyl side chains increases both the short circuit current density and power conversion efficiency notably compared to reference interlayer material, tris-(8-hydroxyquinoline)aluminum. The improved cell performance was attributed to the optimal positions of the highest occupied molecular orbital and the lowest unoccupied molecular orbital (LUMO) of this material, relative to those of the photoactive electron donor poly(3-hexylthiophene) and Ag anode, and evenly distributed LUMO. In addition, the use of these materials as an anode interfacial layer increases the absorption of the solar cell, which could contribute to the formation of excitons and additional current production by the cell.
Photophysical properties of Sn (IV) tetraphenylporphyrin-pyrene dyad with a β-vinyl linker
A Sn(IV)tetraphenylporphyrin (T) has been functionalized with a β-vinyl pyrene (P) and the photophysical properties of the formed dyad (T-P) with its corresponding precursors were studied in three solvents with different polarities using steady-state and time-resolved measurements in ps and fs timescales. When the pyrene moiety is excited at λex = 340 nm, the fluorescence spectroscopy experiments indicate in all the studied solvents, an efficient quenching of the pyrene emission. When excited at either λex = 340 nm or λex = 405 nm, where porphyrin absorbs, a new emissive excited state complex (T-P)∗is observed at wavelengths close to the parent porphyrin emission. The emission is more pronounced in nonpolar hexane showing a mono-exponential decay, but bi-exponential decays are observed in more polar dichloromethane and acetonitrile. When the porphyrin moiety is excited at λex = 425 nm, the fs transient absorption analysis shows two different intermediate species (~7-11 ps and 80-100 ps) with broad absorption in the near-IR region. This implies either the existence of two different excited conformers (T-P)∗, which decay to the ground state via a charge separated state (CSS), or the formation of the (T-P)∗state via the second excited state of the porphyrin moiety, yielding first an excited emissive ν(T-P)∗state, with a lifetime of 80-100 ps.
Branched thiophene oligomer/polymer bulk heterojunction organic solar cell

Thiophene small novel branched structures have been proposed as candidates for dopant agents transporting holes-electron in organic solar cell (OSC). Low-band gap of these branched oligothiophene have been obtained to be used in organic solar cells. Two branched thiophene oligomers, a sexithienylene vinylene (E)-Bis-l,2-(5,5″-Dimethyl-(2,2′:3′,2″-terthiophene) vinylene ,(BSTV) and octathienylene vinylene (BOTV) (E)-Bis-l,2-(5,5″'-Dimethyl- (2,2′:5′,2″:3′,2⌄-tetrathiophene) vinylene oligomers, have been synthesized and used as electron donor or dopant in a bulk heterojunction poly(3-hexylthiophene) (P3HT), /[6,6]-phenyl C61-butyric acid methylester (PCBM), Organic Photovoltaic cell.

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Authors: Martinez, F., Neculqueo, G., Vasquez, S. O., Lemmetyinen, H., Efimov, A., Vivo, P.
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Combination of a novel electrode material and artificial mediators to enhance power generation in an MFC

This study focuses on two main aspects: developing a novel cost-effective electrode material and power production from domestic wastewater using three different mediators. Methylene blue (MB), neutral red (NR) and 2-hydroxy-1,4-naphthoquinone (HNQ) were selected as electrode mediators with different concentrations. A tin-coated copper mesh electrode was tested as anode electrode. Maximum power density of the microbial fuel cell (MFC) with 300 μM MB was 636 mW/m². Optimal mediator concentrations with respect to the achieved maximum power output for MB, NR and HNQ were 300 μM, 200 μM and 50 μM, respectively. The results demonstrate that tin-coated copper mesh showed a higher biocompatibility and electrical conductivity.

General information
Fe₂O₃-TiO₂ Nano-heterostructure Photoanodes for Highly Efficient Solar Water Oxidation

Harnessing solar energy for the production of clean hydrogen by photo-electrochemical water splitting represents a very attractive, but challenging approach for sustainable energy generation. In this regard, the fabrication of Fe₂O₃-TiO₂ photoanodes is reported, showing attractive performances \( \approx 2.0 \text{ mA cm}^{-2} \) at 1.23 V vs. the reversible hydrogen electrode in 1 M NaOH under simulated one-sun illumination. This goal, corresponding to a tenfold photoactivity enhancement with respect to bare Fe₂O₃, is achieved by atomic layer deposition of TiO₂ over hematite (α-Fe₂O₃) nanostructures fabricated by plasma enhanced-chemical vapor deposition and final annealing at 650 °C. The adopted approach enables an intimate Fe₂O₃-TiO₂ coupling, resulting in an electronic interplay at the Fe₂O₃/TiO₂ interface. The reasons for the photocurrent enhancement determined by TiO₂ overlayers with increasing thickness are unraveled by a detailed chemico-physical investigation, as well as by the study of photo-generated charge carrier dynamics. Transient absorption spectroscopy shows that the increased photoelectrochemical response of heterostructured photoanodes compared to bare hematite is due to an enhanced separation of photogenerated charge carriers and more favorable hole dynamics for water oxidation. The stable responses obtained even in simulated seawater provides a feasible route in view of the eventual large-scale generation of renewable energy.
Halogen-bonded photoresponsive materials

The aim of the present review is to illustrate to the reader the state of the art on the construction of supramolecular azobenzene-containing materials formed by halogen bonding. These materials include several examples of polymeric, liquid crystalline or crystalline species whose performances are either superior to the corresponding performances of their hydrogen-bonded analogues or simply distinctive of the halogen-bonded species.

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Halogen bonding enhances nonlinear optical response in poled supramolecular polymers

We demonstrate that halogen bonding strongly enhances the nonlinear optical response of poled supramolecular polymer systems. We compare three nonlinear optical chromophores with similar electronic structures but different bond-donating units, and show that both the type and the strength of the noncovalent interaction between the chromophores and the polymer matrix play their own distinctive roles in the optical nonlinearity of the systems.

Microvesicle- and exosome-mediated drug delivery enhances the cytotoxicity of Paclitaxel in autologous prostate cancer cells

Background Extracellular vesicles (EVs) are naturally occurring membrane particles that mediate intercellular communication by delivering molecular information between cells. In this study, we investigated the effectiveness of two different populations of EVs (microvesicle- and exosome-enriched) as carriers of Paclitaxel to autologous prostate cancer cells. Methods EVs were isolated from LNCaP- and PC-3 prostate cancer cell cultures using differential centrifugation and characterized by electron microscopy, nanoparticle tracking analysis, and Western blot. The uptake of microvesicles and exosomes by the autologous prostate cancer cells was assessed by flow cytometry and confocal microscopy. The EVs were loaded with Paclitaxel and the effectiveness of EV-mediated drug delivery was assessed with viability assays. The distribution of EVs and EV-delivered Paclitaxel in cells was inspected by confocal microscopy. Results Our main finding was that the loading of Paclitaxel to autologous prostate cancer cell-derived EVs increased its cytotoxic effect. This capacity was independent of the EV population and the cell line tested. Although the EVs without the drug increased cancer cell viability, the net effect of enhanced cytotoxicity remained. Both EV populations delivered Paclitaxel to the recipient cells through endocytosis, leading to the release of the drug from within the cells. The removal of EV surface proteins did not affect exosomes, while the drug delivery mediated by microvesicles was partially inhibited. Conclusions Cancer cell-derived EVs can be used as effective carriers of Paclitaxel to their parental cells, bringing the drug into the cells through an endocytic pathway and increasing its cytotoxicity. However, due to the increased cell viability, the use of cancer cell-derived EVs must be further investigated before any clinical applications can be designed.
**General information**

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Scopus rating (2009): SJR 2.897 SNIP 2.033
Scopus rating (2008): SJR 2.25 SNIP 1.886
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Scopus rating (2003): SJR 1.592 SNIP 1.682
Scopus rating (2002): SJR 1.393 SNIP 1.534
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**Nano-graphite cold cathodes for electric solar wind sail**

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Role of the bridge in photoinduced electron transfer in porphyrin-fullerene dyads

The role of π-conjugated molecular bridges in through-space and through-bond electron transfer is studied by comparing two porphyrin-fullerene donor-acceptor (D-A) dyads. One dyad, ZnP-Ph-C_{60} (ZnP=zinc porphyrin), incorporates a phenyl bridge between D and A and behaves very similarly to analogous dyads studied previously. The second dyad, ZnP-EDOTV-C_{60}, introduces an additional 3,4-ethylenedioxythienylvinylene (EDOTV) unit into the conjugated bridge, which increases the distance between D and A, but, at the same time, provides increased electronic communication between them. Two essential outcomes that result from the introduction of the EDOTV unit in the bridge are as follows: 1) faster charge recombination, which indicates enhanced electronic coupling between the charge-separated and ground electronic states; and 2) the disappearance of the intramolecular exciplex, which mediates photoinduced charge separation in the ZnP-Ph-C_{60} dyad. The latter can be interpreted as a gradual decrease in electronic coupling between locally excited singlet states of D and A when introducing the EDOTV unit into the D-A bridge.

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Authors: Pelado, B., Abou-Chahine, F., Calbo, J., Caballero, R., delaCruz, P., Junquera-Hernández, J. M., Ortí, E., Tkachenko, N. V., Langa, F.
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Synthesis of fluorescent naphthoquinolizines via intramolecular houben-hoesch reaction

The repertoire of synthetic methods leading to aza-analogues of polycyclic aromatic heterocycles has been enlarged by the discovery of the rearrangement of 10-substituted benzo[h]quinolines into compounds bearing an azonia-pyrene moiety. Acid-mediated intramolecular cyclization of derivatives bearing-CH2CN and-CH2CO2Et groups led to compounds bearing a 5-substituted benzo[de]pyrido[3,2,1-ij]quinolinium core. Advanced photophysical studies including time-correlated single photon counting (TCSPC) and transient absorption spectroscopy of 5-aminobenzo[de]pyrido[3,2,1-ij]quinolin-4-ium salt and 5H-benzo[de]pyrido[3,2,1-ij]quinolin-5-one showed their promising optical properties such as high fluorescence quantum yields (37-59%), which was almost independent of the solvent, and high tenability of the absorption band position upon changing the solvent. The benzo[de]pyrido[3,2,1-ij]quinolinium salt selectively stains nucleic acids (in the nucleus and mitochondria) in eukaryotic cells.
Van der Waals interactions are critical in Car-Parrinello molecular dynamics simulations of porphyrin-fullerene dyads

The interplay between electrostatic and van der Waals (vdW) interactions in porphyrin-C₆₀ dyads is still under debate despite its importance in influencing the structural characteristics of such complexes considered for various applications in molecular photovoltaics. In this article, we sample the conformational space of a porphyrin-C₆₀ dyad using Car-Parrinello molecular dynamics simulations with and without empirical vdW corrections. Long-range vdW interactions, which are poorly described by the commonly used density functional theory functionals, prove to be essential for a proper dynamics of the dyad moieties. Inclusion of vdW corrections brings porphyrin and C₆₀ close together in an orientation that is in agreement with experimental observations. The structural differences arising from the vdW corrections are shown to be significant for several properties and potentially less important for others. Additionally, our Mulliken population analysis reveals that contrary to the common belief, porphyrin is not the primary electron donating moiety for C₆₀. In the considered dyad, fullerene's affinity for electrons is primarily satisfied by charge transfer from the amide group of the linker. However, we show that in the absence of another suitable bound donor, C₆₀ can withdraw electrons from porphyrin if it is sufficiently close.
π-Expanded α,β-unsaturated ketones: Synthesis, optical properties, and two-photon-induced polymerization

A library of π-expanded α,β-unsaturated ketones was designed and synthesized. They were prepared by a combination of Wittig reaction, Sonogashira reaction, and aldol condensation. It was further demonstrated that the double aldol condensation can be performed effectively for highly polarized styrene- and diphenylacetylene-derived aldehydes. The strategic placement of two dialkylamino groups at the periphery of D-π-A-π-D molecules resulted in dyes with excellent solubility. These ketones absorb light in the region 400-550nm. Many of them display strong solvatochromism so that the emission ranges from 530-580nm in toluene to the near-IR region in benzonitrile. Ketones based on cyclobutanone as central moieties display very high fluorescence quantum yields in nonpolar solvents, which decrease drastically in polar media. Photophysical studies of these new functional dyes revealed that they possess an enhanced two-photon absorption cross section when compared with simpler ketone derivatives. Due to strong polarization of the resulting dyes, values of two-photon absorption cross sections on the level of 200-300GM at 800nm were achieved, and thanks to that as well as the presence of the keto group, these new two-photon initiators display excellent performance so that the operating region is 5-75mW in some cases.

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Authors: Nazir, R., Bourquard, F., Balciunas, E., Smolen, S., Gray, D., Tkachenko, N. V., Farsari, M., Gryko, D. T.
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Monoisomeric phthalocyanine-fullerene dyads with e- and cis-3 addition pattern; synthesis, modeling, photovoltage and solar cell experiments

Synthesis and characterization of two A(2)B(2)-type monoisomeric phthalocyanines and phthalocyanine-fullerene (Pc-C-60) dyads, in which fullerene is regioselectively attached to phthalocyanine with two linkers, are described. H-1 NMR spectroscopy results clearly indicate an e addition pattern of the fullerene moiety in trans-dyad 9, and apparently a cis-3 addition pattern in cis-dyad 10. The possible spatial arrangements of 9 and 10 were further examined by molecular modeling. The dyads have polar (-OH) side chains on the fullerene side of the dyad providing a possibility to produce oriented donor-acceptor (D-A) Langmuir monolayers on aqueous subphase, which can be shifted onto a solid surface. When deposited on a solid electrode material, parallel vertical alignment of the phthalocyanine and fullerene moieties in 100% dyad monolayer was obtained and vertical electron transfer from Pc to C 60 upon photoexcitation was demonstrated. Introduction of the dyads as an oriented interfacial monolayer between the photoactive layer and metal anode improved the power conversion efficiency in inverted organic solar cells.
Supramolecular donor-acceptor assemblies were prepared and studied with spectroscopic methods. The two main objectives of this work were: (i) fundamental study of photoinduced energy and electron transfer processes in self-assembled supramolecular donor-acceptor complexes in solutions and (ii) self-assembly and photophysical characterization of donor-acceptor films on titanium dioxide (TiO$_2$) surface. The study of these systems aims to develop more complex architectures for artificial photosynthesis and understand factors that affect efficiency of the photoinduced energy and electron transfer processes in natural and artificial photosynthesis. This knowledge can be used for building photoactive molecular devices such as organic solar cells. The singlet excited state energy transfer in dyads formed via axial metal–ligand coordination of free-base porphyrin to metal (Mg, Ru) complexes of phthalocyanine was observed. The position of imidazole linker group on one of the meso-aryl groups of the free-base porphyrin was used to tune the rates of energy transfer. The two-point binding provides better control over complex geometry and it was implemented utilizing metal-ligand and crown-ether coordination in zinc chlorin–fullerene supramolecular dyads. This approach allowed to increase the binding efficiency and achieve a well-defined mutual orientation between the moieties. The electron transfer rate was found to depend on the donor-acceptor distance as well as the mutual orientation of the entities and could be manipulated by changing positions of binding groups. The donor-acceptor layers were assembled on TiO$_2$ using two methods. First, a layer of covalently linked porphyrin–phthalocyanine dyads was formed on TiO$_2$ via supramolecular approach. Then, a new method was developed to construct donor-acceptor two-layer films using separate porphyrin and fullerene molecules. In both cases, photo-excitation of donor molecules resulted in charge-separation (CS) inside the organic layer and sequential electron transfer towards the TiO$_2$. Furthermore, the charge recombination (CR) process was found to be slower than for systems sensitized with single chromophores.
In this work, new photoactive materials were tested in the active and anode buffer layers of the inverted ITO|ZnO|donor:PC60/70BM|Buffer|Au/Ag organic bulk heterojunction (BHJ) solar cell. The molecular properties of the materials synthesized for this work were designed in order to improve the efficiency of the inverted solar cell structure. In addition to testing the materials in the cells, their effect on the cell function was investigated. The work aimed to understand the effects of the studied buffer and active layer materials in the cell function and photovoltaic performance. Organometallic n-type tris-(8-hydroxyquinoline)aluminum (Alq3) derivatives, p-type aryl end-capped quaterthiophenes, and a combined p- and n-type Alq3 end-capped hexathiophene were tested as hole transporting anode buffer layer materials. As the various different materials provided a diverse buffer material selection, the properties of the materials for improved cell function were investigated by spectroscopic, electrochemical, computational and thermoanalytical methods. The studied Alq3 derivatives have electron donating amino substituents, either piperidine, pyrrolidine or morpholine rings, on the 5-position of the 8-hydroxyquinoline ligands, which ease the oxidation of the complexes and elevate the highest occupied molecular orbital (HOMO) energy levels. The higher HOMO levels of the derivatives, compared to that of Alq3, reduce the hole extraction barrier in the cell. Therefore, the cells with the derivatives as buffer layers had a higher short circuit current (Isc) compared to that with Alq3. Simultaneously, due to higher hole injection barrier, the cells with the derivatives as buffer layers had lower open circuit voltage (Voc) than the cell with Alq3. The derivative with the morpholine ring has ideal energy levels with respect to the created energy barriers. Thus, the cell with the morpholine derivative as buffer layer performed better than the cell with Alq3. The quaterthiophenes studied in this work have cyanophenyl or methoxyphenyl end-groups and methyl or hexyl side chains attached to the thiophene backbone. These structural differences affect their electronic distribution, absorption profile, energy levels and molecular packing, especially in the solid state. The use of p-cyano end-capped quaterthiophene with hexyl side chains as an anode buffer layer resulted in a better cell power conversion efficiency compared to that with Alq3. The use of the Alq3 end-capped hexathiophene as an anode buffer layer decreased the cell serial resistance (Rs) and increased Isc. Photoinduced reactions, such as energy or electron transfer, between the Alq3 or aryl end-capped oligothiophene buffer materials and photoactive layer partly explain the improved Isc. A synthesized benzodithiophene-benzotriazole donor-acceptor (D-A) copolymer was compared as donor material with three previously studied fluorine-benzotriazole D-A copolymers. The relation between donor polymer structural properties and photovoltaic performance was studied by combining computational and experimental methods. The cell with the benzodithiophene-benzotriazole copolymer as donor material had better efficiency than the cells with the fluorine-benzotriazole copolymers. Calculations on the molecular geometry, energy levels, molecular orbitals, and lowest energy excitations provided an additional perspective to understand the polymer’s function as donor material. Based on the calculations, the benzodithiophene-benzotriazole copolymer had a more planar backbone, continuous LUMO electron density, longer conjugation and better exciton and charge transport properties compared to those of the fluorine-benzotriazole copolymers. Bulky side groups in the fluorine-benzotriazole copolymers caused steric hindrance and twisting or bending of the backbone. As a result, the electron density concentrates in parts of the polymer structure and the conjugation weakens or is broken. As the delocalization does not cover the whole polymer structure, excitons or charges are trapped in the gaps of the discontinuous molecular orbitals. Alq3, aryl and 8-phenoxyquinoline end-capped oligothiophenes were used as dopant materials in the P3HT:PC60BM BHJ photoactive layer. In the ternary blend of the dopant, P3HT and PC60BM molecules, intermolecular interactions are likely as the molecules are in close proximity in the solid photoactive layer. The effect of dopant molecules on the cell function was studied by solar cell experiments. To investigate the intermolecular interaction of the dopant molecules with the active layer components, P3HT donor and PC60BM acceptor, steady state and time resolved spectroscopic measurements were carried out in chloroform solutions. Based on the measurements, Alq3 end-capped hexathiophene donates an electron to PC60BM. Photoinduced energy transfer was observed between the cyanophenyl end-capped quaterthiophene and PC60BM. The cell absorption increases with doping. Thus, dopant molecules function as additional light absorbers in the photoactive layer. After excitation, the dopant molecules transfer electrons or energy to PC60BM, which increases the cell Isc and power conversion efficiency. When a cyanophenyl end-capped oligothiophene with diketopyrrolopyrrole (DPP) core was used as dopant, the cell emission decreased. DPP-group inclusion broadens the dopant absorption to the near IR-region. Therefore, the absorption of the dopant overlaps with P3HT emission and the dopant molecules can reabsorb the light emitted by P3HT. In this case, the cell Isc and power conversion efficiency increased further.
Binding Affinity and Mechanism of Polymer-DNA Polyplexes for Gene Delivery

The mechanism of polyethylenimine−DNA, poly(L-lysine)−DNA, peptide−DNA, and PBAE−DNA complex formation was studied by a time-resolved spectroscopic method. The data were analysed by a cooperative model for multivalent ligand binding to multisubunit substrate. The formation of polyplexes with polyethylenimines, poly(L-lysine) and peptide (KK)₂KGGC is observed to be positively cooperative and negatively cooperative with PBAEs. Polymers with positive cooperativity reach about 100% saturation in binding DNA, whereas for polymers with negative cooperativity, the saturation level remains at about 80–90%. The type of amine groups (primary, secondary and tertiary) of the polymers has an effect on the binding constants and the degree of cooperativity. The effects of pH, type of amine groups and polymer structure on the mechanism of the polyplex formation were studied with polyethylenimines (PEI) and poly(L-lysine) (PLL). At pH 5.2 and 7.4 for PEIs and PLL, the formation of the polyplex core was observed to be complete at N/P = 2, at which point nearly all DNA phosphate groups were bound by polymer amine groups. At higher N/P ratios, excess polymer binds to the core polyplex, forming a shell over the core. At pH 9.2, the core is formed at higher N/P ratios than at lower pH levels except for PLL, which behaves similarly at all pH levels. The overall cooperative binding constants are higher at pH 5.2 than at 9.2 due to the higher degree of amine group protonation at lower pH levels. The ionic strength and pH affect the binding mechanism with peptide (KK)₂KGGC polyplexes, but changing the buffer does not. Molecular weight shows a clear effect on the mechanism and efficiency of the polyplex formation: for the high-molecular weight polymers (BPEI and PLL), the saturation level is reached at lower N/P ratios than for low-molecular weight polymers (SPEI and peptide). In the absence of excess PEI, the transgene expression levels are lower than in the presence of it. However, the fluorescence properties of the polyplexes in the absence and the presence of excess PEI are similar. Hence, the original structure of the polyplex core is retained during the shell formation. The molecular structures of the poly(β-amino ester)s (PBAEs) can be modified in a controlled way with the accuracy of single carbon unit. The effect of very small changes in the polymer structure on the formation of the polyplexes was studied by changing the length of the backbone and the side chain, by adding end caps to the polymers and by changing the molecular weight of the polymers. For PBAEs without end caps, the highest saturation levels and overall binding constants were observed for the linear backbones and side chains when the number of carbons was four or five, respectively. The end-capping of PBAEs increases the amine density and the efficiency of polyplex formation, which is observed as higher saturation levels for the end-capped PBAEs. The presence of an OH-group in the end cap induces a change in the binding mechanism. The length of the backbone and the side chain of PBAEs were observed to be important via amine density, hydrophobicity and steric hindrance to the complex formation. High-molecular weight PBAEs formed polyplexes more effectively than smaller ones.
Are two azo groups better than one? Investigating the photoresponse of polymer-bisazobenzene complexes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Frontier Photonics
Authors: Vapaavuori, J., Goulet-Hanssens, A., Heikkinen, I. T., Barrett, C. J., Pririmagi, A.
Number of pages: 8
Pages: 5089-5096
Publication date: 2014
Peer-reviewed: Yes

Publications information
Journal: Chemistry of Materials
Volume: 26
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Ratings:
Scopus rating (2016): SJR 4.114 SNIP 1.905 CiteScore 8.89
Scopus rating (2015): SJR 4.038 SNIP 2.102 CiteScore 9.38
Scopus rating (2014): SJR 3.603 SNIP 2.253 CiteScore 8.89
Scopus rating (2013): SJR 3.658 SNIP 2.277 CiteScore 8.94
Scopus rating (2012): SJR 4.169 SNIP 2.264 CiteScore 8.1
Scopus rating (2011): SJR 3.484 SNIP 2.145 CiteScore 7.38
Scopus rating (2010): SJR 3.267 SNIP 1.849
Scopus rating (2009): SJR 2.894 SNIP 1.763
Scopus rating (2008): SJR 2.882 SNIP 1.844
Scopus rating (2007): SJR 3.111 SNIP 1.863
Scopus rating (2006): SJR 3.168 SNIP 1.943
Scopus rating (2005): SJR 2.746 SNIP 1.937
Scopus rating (2004): SJR 2.5 SNIP 1.976
Scopus rating (2003): SJR 2.56 SNIP 1.938
Scopus rating (2002): SJR 2.499 SNIP 1.894
Scopus rating (2001): SJR 2.321 SNIP 1.911
Scopus rating (2000): SJR 2.201 SNIP 1.686
Scopus rating (1999): SJR 2.23 SNIP 1.796
Charge-Transfer Dynamics in Poly(3-hexylthiophene):Perylenediimide-C-60 Blend Films Studied by Ultrafast Transient Absorption

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Number of pages: 6
Pages: 10625-10630
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 118
Issue number: 20
ISSN (Print): 1932-7447
Ratings:
Scopus rating (2016): CiteScore 4.48 SJR 1.948 SNIP 1.181
Scopus rating (2015): SJR 1.917 SNIP 1.268 CiteScore 4.68
Scopus rating (2014): SJR 2.027 SNIP 1.448 CiteScore 5.08
Scopus rating (2013): SJR 2.134 SNIP 1.439 CiteScore 5.14
Scopus rating (2012): SJR 2.514 SNIP 1.46 CiteScore 4.98
Scopus rating (2011): SJR 2.32 SNIP 1.457 CiteScore 4.92
Scopus rating (2010): SJR 2.438 SNIP 1.356
Scopus rating (2009): SJR 2.128 SNIP 1.417
Scopus rating (2008): SJR 1.856 SNIP 1.033
Original language: English
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Deprotonation of resorcinarenes by mono- and diamine bases: complexation and intermolecular interactions in the solid state

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Beyeh, N. K., Valkonen, A., Rissanen, K.
Number of pages: 7
Pages: 3758-3764
Publication date: 2014
Dynamics of time-resolved photoluminescence in GaInNAs and GaNAsSb solar cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Gubanov, A., Polojärvi, V., Aho, A., Tukiainen, A., Tkachenko, N. V., Guina, M.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Nanoscale Research Letters
Volume: 9
Article number: 80
ISSN (Print): 1931-7573
Ratings:
Scopus rating (2016): SJR 0.589 SNIP 0.746 CiteScore 2.15
Scopus rating (2015): SJR 0.538 SNIP 0.653 CiteScore 1.69
Scopus rating (2014): SJR 0.748 SNIP 1.019 CiteScore 2.15
Scopus rating (2013): SJR 0.79 SNIP 0.967 CiteScore 2.23
Scopus rating (2012): SJR 1.049 SNIP 1.073 CiteScore 2.58
Scopus rating (2011): SJR 1.04 SNIP 1.124 CiteScore 2.88
Effect of mutual position of electron donor and acceptor on photoinduced electron transfer in supramolecular chlorophyll-fullerene dyads

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Stranius, K., Iashin, V., Nikkonen, T., Muuronen, M., Helaja, J., Tkachenko, N.
Number of pages: 10
Pages: 1420-1429
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry A
Volume: 118
Issue number: 8
ISSN (Print): 1089-5639
Ratings:
Scopus rating (2016): SJR 1.258 SNIP 0.98 CiteScore 2.64
Scopus rating (2015): SJR 1.179 SNIP 1.106 CiteScore 2.78
Scopus rating (2014): SJR 1.154 SNIP 1.071 CiteScore 2.65
Scopus rating (2013): SJR 1.194 SNIP 1.102 CiteScore 2.84
Scopus rating (2012): SJR 1.494 SNIP 1.124 CiteScore 2.78
Scopus rating (2011): SJR 1.402 SNIP 1.135 CiteScore 2.87
Scopus rating (2010): SJR 1.466 SNIP 1.102
Scopus rating (2009): SJR 1.562 SNIP 1.132
Scopus rating (2008): SJR 1.787 SNIP 1.093
Scopus rating (2007): SJR 1.907 SNIP 1.136
Scopus rating (2006): SJR 1.728 SNIP 1.195
Scopus rating (2005): SJR 1.789 SNIP 1.215
Scopus rating (2004): SJR 1.669 SNIP 1.224
Scopus rating (2003): SJR 1.75 SNIP 1.241
Scopus rating (2002): SJR 1.81 SNIP 1.196
Scopus rating (2001): SJR 1.732 SNIP 1.224
Scopus rating (2000): SJR 1.953 SNIP 1.272
Scopus rating (1999): SJR 1.507 SNIP 1.592
Original language: English
DOIs: 10.1021/jp412442t

Bibliographical note
Contribution: organisation=orc,FACT1=0.7
Contribution: organisation=keb,FACT2=0.3
Portfolio EDEND: 2014-04-29
Publisher name: SpringerOpen
Source: researchoutputwizard
Source-ID: 371
Research output: Scientific - peer-review » Article

Bibliographical note
Contribution: organisation=keb,FACT1=1
Portfolio EDEND: 2014-04-29
Publisher name: American Chemical Society
Electricity generating capacity and performance deterioration of a microbial fuel cell fed with beer brewery wastewater

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Köroglu, E., Özkaya, B., Denktas, C., Cakmakci, M.
Number of pages: 7
Pages: 672-678
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Bioscience and Bioengineering
Volume: 118
Issue number: 6
ISSN (Print): 1389-1723
Ratings:
Scopus rating (2016): SJR 0.733 SNIP 0.951 CiteScore 2.32
Scopus rating (2015): SJR 0.71 SNIP 0.909 CiteScore 2.13
Scopus rating (2014): SJR 0.742 SNIP 0.933 CiteScore 2.05
Scopus rating (2013): SJR 0.734 SNIP 0.947 CiteScore 2.17
Scopus rating (2012): SJR 0.732 SNIP 0.957 CiteScore 1.95
Scopus rating (2011): SJR 0.726 SNIP 0.926 CiteScore 1.97
Scopus rating (2010): SJR 0.747 SNIP 0.992
Scopus rating (2009): SJR 0.788 SNIP 0.984
Scopus rating (2008): SJR 0.839 SNIP 1.159
Scopus rating (2007): SJR 0.662 SNIP 0.823
Scopus rating (2006): SJR 0.592 SNIP 0.775
Scopus rating (2005): SJR 0.474 SNIP 0.693
Scopus rating (2004): SJR 0.549 SNIP 0.664
Scopus rating (2003): SJR 0.498 SNIP 0.709
Scopus rating (2002): SJR 0.49 SNIP 0.694
Scopus rating (2001): SJR 0.501 SNIP 0.769
Scopus rating (2000): SJR 0.482 SNIP 0.771
Scopus rating (1999): SJR 0.603 SNIP 0.854
Original language: English
DOIs:
10.1016/j.jbiosc.2014.05.006

Bibliographical note
Contribution: organisation=keb,FACT1=1<br/>Portfolio EDEND: 2015-03-02<br/>Publisher name: Society for Biotechnology, Japan
Source: researchoutputwizard
Source-ID: 762
Research output: Scientific - peer-review » Article

Excited State Intramolecular Proton Transfer in pi-Expanded Phenazine-Derived Phenols

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Piechowska, J., Virkki, K., Sadowski, B., Lemmetyinen, H., Tkachenko, N. V., Gryko, D. T.
Number of pages: 8
Formation of a stable polymer blue phase under UV irradiation of Langmuir-Schaefer films of diin N-arylcarbamate derivative

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Alekseev, A., Domnin, I., Ivanov, A., Vuorimaa-Laukkanen, E., Lemmetyinen, H., Tereshchenko, N.
Number of pages: 5
Pages: 160-164
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Bulletin of the Lebedev Physics Institute
Volume: 41
Issue number: 6
ISSN (Print): 1068-3356
Ratings:
Scopus rating (2016): SJR 0.192 SNIP 0.491 CiteScore 0.34
Scopus rating (2015): SJR 0.131 SNIP 0.411 CiteScore 0.25
Scopus rating (2014): SJR 0.128 SNIP 0.203 CiteScore 0.13
Scopus rating (2013): SJR 0.131 SNIP 0.176 CiteScore 0.13
Scopus rating (2012): SJR 0.126 SNIP 0.164 CiteScore 0.12
Scopus rating (2011): SJR 0.117 SNIP 0.105 CiteScore 0.09
Scopus rating (2010): SJR 0.104 SNIP 0.002
Original language: English
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10.3103/S1068335614060025

Bibliographical note
High-modulation-depth surface relief gratings using s-s polarization configuration in supramolecular polymer-azobenzene complexes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Frontier Photonics
Authors: Sobolewska, A., Bartkiewicz, S., Priimagi, A.
Number of pages: 6
Pages: 23279-23284
Publication date: 2014
Peer-reviewed: Yes

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Journal: Journal of Physical Chemistry C
Volume: 118
Issue number: 40
ISSN (Print): 1932-7447
Ratings:
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Scopus rating (2015): SJR 1.917 SNIP 1.268 CiteScore 4.68
Scopus rating (2014): SJR 2.027 SNIP 1.448 CiteScore 5.08
Scopus rating (2013): SJR 2.134 SNIP 1.439 CiteScore 5.14
Scopus rating (2012): SJR 2.514 SNIP 1.46 CiteScore 4.98
Scopus rating (2011): SJR 2.32 SNIP 1.457 CiteScore 4.92
Scopus rating (2010): SJR 2.438 SNIP 1.356
Scopus rating (2009): SJR 2.128 SNIP 1.417
Scopus rating (2008): SJR 1.856 SNIP 1.033
Original language: English
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Light-driven surface patterning of supramolecular polymers with extremely low concentration of photoactive molecules

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Frontier Photonics
Authors: Koskela, J. E., Vapaavuori, J., Ras, R. H. A., Priimagi, A.
Number of pages: 5
Pages: 1196-1200
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: ACS Macro Letters
Volume: 3
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Ratings:
Modeling of photoactive conjugated donor-acceptor copolymers: the effect of the exact HF exchange in DFT functionals on geometries and gap energies of oligomer and periodic models

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Niskanen, M., Hukka, T.
Number of pages: 12
Pages: 13294-13305
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Physical Chemistry Chemical Physics
Volume: 16
ISSN (Print): 1463-9076
Ratings:
Scopus rating (2016): CiteScore 4.06 SJR 1.678 SNIP 1.117
Scopus rating (2015): SJR 1.771 SNIP 1.244 CiteScore 4.45
Scopus rating (2014): SJR 1.772 SNIP 1.253 CiteScore 4.29
Scopus rating (2013): SJR 1.715 SNIP 1.216 CiteScore 4.05
Scopus rating (2012): SJR 1.916 SNIP 1.184 CiteScore 3.67
Scopus rating (2011): SJR 1.697 SNIP 1.203 CiteScore 3.6
Scopus rating (2010): SJR 1.802 SNIP 1.196
Scopus rating (2009): SJR 2.127 SNIP 1.369
Scopus rating (2008): SJR 2.158 SNIP 1.211
Scopus rating (2007): SJR 1.84 SNIP 1.138
Scopus rating (2006): SJR 1.467 SNIP 1.128
Scopus rating (2005): SJR 1.389 SNIP 1.104
Scopus rating (2004): SJR 1.173 SNIP 1.007
Scopus rating (2003): SJR 1.093 SNIP 0.925
Scopus rating (2002): SJR 1.122 SNIP 0.973
Scopus rating (2001): SJR 1.09 SNIP 0.914
Scopus rating (2000): SJR 0.948 SNIP 1.068
Scopus rating (1999): SJR 0.121 SNIP 0
Original language: English
DOIs:
10.1039/c4cp01165a
Additional files:
MNiskanen_TIHukka_PCCP_2014_16_13294_13305

Bibliographical note
Contribution: organisation=keb,FACT1=1
Portfolio EDEND: 2014-11-20
Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 787
Research output: Scientific - peer-review › Article
Monoisomeric phthalocyanines and phthalocyanine-fullerene dyads with polar side chains: synthesis, modeling, and photovoltage

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State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Ranta, J., Kaunisto, K., Niskanen, M., Efimov, A., Hukka, T. I., Lemmetyinen, H.
Number of pages: 12
Pages: 2754-2765
Publication date: 2014
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Journal: Journal of Physical Chemistry C
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Scopus rating (2016): CiteScore 4.48 SJR 1.948 SNIP 1.181
Scopus rating (2015): SJR 1.917 SNIP 1.268 CiteScore 4.68
Scopus rating (2014): SJR 2.027 SNIP 1.448 CiteScore 5.08
Scopus rating (2013): SJR 2.134 SNIP 1.439 CiteScore 5.14
Scopus rating (2012): SJR 2.514 SNIP 1.46 CiteScore 4.98
Scopus rating (2011): SJR 2.32 SNIP 1.457 CiteScore 4.92
Scopus rating (2010): SJR 2.438 SNIP 1.356
Scopus rating (2009): SJR 2.128 SNIP 1.417
Scopus rating (2008): SJR 1.856 SNIP 1.033
Original language: English
DOIs:
10.1021/jp4096002

Bibliographical note
Contribution: organisation=keb,FACT1=1<br/>Portfolio EDEND: 2014-06-27<br/>Publisher name: American Chemical Society

Organic-inorganic azafullerene-gold C59N-Au nanohybrid: Synthesis, characterization, and properties

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Rotas, G., Niemi, M., Tkachenko, N. V., Zhao, S., Shinohara, H., Tagmatarhis, N.
Number of pages: 7
Pages: 14729-14735
Publication date: 2014
Peer-reviewed: Yes

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Journal: Chemistry: A European Journal
Volume: 20
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ISSN (Print): 0947-6539
Ratings:
Photo-induced electron transfer at nanostructured semiconductor-zinc porphyrin interface

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Hakola, H., Pyymaki Perros, A., Myllyperkiö, P., Kurotobi, K., Lipsanen, H., Imahori, H., Lemmetyinen, H., Tkachenko, N. V.
Number of pages: 5
Pages: 47-51
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Chemical Physics Letters
Volume: 592
ISSN (Print): 0009-2614
Ratings:
Scopus rating (2016): SJR 0.726 SNIP 0.721 CiteScore 1.71
Scopus rating (2015): SJR 0.733 SNIP 0.747 CiteScore 1.83
Scopus rating (2014): SJR 0.757 SNIP 0.773 CiteScore 1.83
Scopus rating (2013): SJR 0.856 SNIP 0.844 CiteScore 2.07
Scopus rating (2012): SJR 1.101 SNIP 0.916 CiteScore 2.2
Scopus rating (2011): SJR 1.156 SNIP 1.013 CiteScore 2.38
Scopus rating (2010): SJR 1.207 SNIP 0.94
Scopus rating (2009): SJR 1.234 SNIP 0.972
Scopus rating (2008): SJR 1.296 SNIP 0.937
Scopus rating (2007): SJR 1.43 SNIP 1.001

Bibliographical note
Contribution: organisation=keb,FACT1=1<br/>Portfolio EDEND: 2014-11-20<br/>Publisher name: Wiley - V C H Verlag GmbH & Co. KGaA
Source: researchoutputwizard
Source-ID: 1407
Research output: Scientific - peer-review › Article
Recognition of N-Alkyl and N-Aryl acetamides by N-Alkyl ammonium resorcinarene chlorides

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Beyeh, N. K., Ala-Korpi, A., Cetina, M., Valkonen, A., Rissanen, K.
Number of pages: 7
Pages: 15144-15150
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Chemistry: A European Journal
Volume: 20
Issue number: 46
ISSN (Print): 0947-6539
Ratings:
Scopus rating (2016): CiteScore 5.03 SJR 2.247 SNIP 1.046
Scopus rating (2015): SJR 2.416 SNIP 1.184 CiteScore 4.99
Scopus rating (2014): SJR 2.487 SNIP 1.219 CiteScore 5.51
Scopus rating (2013): SJR 2.604 SNIP 1.239 CiteScore 5.68
Scopus rating (2012): SJR 2.884 SNIP 1.294 CiteScore 5.55
Scopus rating (2011): SJR 2.726 SNIP 1.336 CiteScore 5.46
Scopus rating (2010): SJR 2.527 SNIP 1.292
Scopus rating (2009): SJR 2.499 SNIP 1.365
Scopus rating (2008): SJR 2.887 SNIP 1.407
Scopus rating (2007): SJR 3.233 SNIP 1.532
Scopus rating (2006): SJR 2.911 SNIP 1.505
Scopus rating (2005): SJR 2.62 SNIP 1.454
Scopus rating (2004): SJR 2.32 SNIP 1.472
Scopus rating (2003): SJR 2.156 SNIP 1.45
Scopus rating (2002): SJR 2.554 SNIP 1.472
Scopus rating (2001): SJR 2.834 SNIP 1.612
Scopus rating (2000): SJR 2.956 SNIP 1.652
Scopus rating (1999): SJR 3.013 SNIP 1.73
Original language: English
DOIs:
10.1002/chem.201402533
ROFRET: A Molecular-Scale Fluorescent Probe Displaying Viscosity-Enhanced Intramolecular Förster Energy Transfer

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Bai, S., Benniston, A. C., Whittle, V. L., Lemmetyinen, H., Tkachenko, N. V.
Number of pages: 8
Pages: 3089-3096
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: ChemPhysChem
Volume: 115
Issue number: 14
ISSN (Print): 1439-4235
Ratings:
Scopus rating (2016): CiteScore 2.81 SJR 1.264 SNIP 0.771
Scopus rating (2015): SJR 1.334 SNIP 0.912 CiteScore 3.21
Scopus rating (2014): SJR 1.362 SNIP 0.905 CiteScore 3.12
Scopus rating (2013): SJR 1.442 SNIP 0.948 CiteScore 3.22
Scopus rating (2012): SJR 1.763 SNIP 0.955 CiteScore 3.24
Scopus rating (2011): SJR 1.719 SNIP 1.05 CiteScore 3.37
Scopus rating (2010): SJR 1.872 SNIP 1.031
Scopus rating (2009): SJR 1.91 SNIP 1.12
Scopus rating (2008): SJR 2.153 SNIP 1.098
Scopus rating (2007): SJR 2.215 SNIP 1.129
Scopus rating (2006): SJR 2.008 SNIP 1.159
Scopus rating (2005): SJR 2.067 SNIP 1.147
Scopus rating (2004): SJR 1.799 SNIP 1.087
Scopus rating (2003): SJR 1.666 SNIP 1.128
Scopus rating (2002): SJR 1.026 SNIP 0.71
Scopus rating (2001): SJR 0.258 SNIP 0.425
Scopus rating (2000): SJR 0.198 SNIP 0.278
Scopus rating (1999): SJR 0.386 SNIP 0.495
Original language: English
DOIs: 10.1002/cphc.201402320

Slow charge recombination and enhanced photoelectrochemical properties of Diazaporphyrin-Fullerene linked dyad

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Solid state anion-pi interactions involving polyhalides

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Giese, M., Albrecht, M., Bohnen, C., Repenko, T., Valkonen, A., Rissanen, K.
Number of pages: 8
Pages: 1873-1880
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Dalton Transactions
Volume: 43
Issue number: 4
ISSN (Print): 1477-9234
Ratings:
Scopus rating (2016): SJR 1.243 SNIP 0.931 CiteScore 3.85
Scopus rating (2015): SJR 1.351 SNIP 1.026 CiteScore 4.1
Scopus rating (2014): SJR 1.413 SNIP 1.085 CiteScore 4.06
Scopus rating (2013): SJR 1.436 SNIP 1.083 CiteScore 4.07
Scopus rating (2012): SJR 1.554 SNIP 1.001 CiteScore 3.79
Scopus rating (2011): SJR 1.505 SNIP 1.013 CiteScore 3.68
Scopus rating (2010): SJR 1.399 SNIP 0.875
Scopus rating (2009): SJR 0.928 SNIP 0.783
Scopus rating (2008): SJR 0.629 SNIP 0.572

Bibliographical note
Contribution: organisation=keb,FACT1=1<br/>Portfolio EDEND: 2014-05-28<br/>Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 1813
Research output: Scientific - peer-review > Article
Spectroscopic study of a synthesized Alq3 end-capped oligothiophene applied in organic solar cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Number of pages: 10
Pages: 8846-8855
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: RSC Advances
Volume: 4
Issue number: 17
ISSN (Print): 2046-2069
Ratings:
Scopus rating (2016): CiteScore 3.06 SJR 0.875 SNIP 0.743
Scopus rating (2015): SJR 0.959 SNIP 0.837 CiteScore 3.42
Scopus rating (2014): SJR 1.114 SNIP 0.965 CiteScore 3.87
Scopus rating (2013): SJR 1.117 SNIP 0.903 CiteScore 3.74
Scopus rating (2012): SJR 0.863 SNIP 0.603 CiteScore 2.4
Original language: English
DOIs:
10.1039/c3ra47367h

Subcellular localization of bacteriophage PRD1 proteins in Escherichia coli

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics, Integrated Technologies for Tissue Engineering Research (ITTE)
Synthesis and properties of a meso-tris-ferrocene appended zinc(II) porphyrin and a critical evaluation of its dye sensitised solar cell (DSSC) performance

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Sirbu, D., Turta, C., Benniston, A., Abou-Chahine, F., Lemmetyinen, H., Tkachenko, N., Wood, C., Gibson, E.
Number of pages: 10
Pages: 22733-22742
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: RSC Advances
Volume: 4
ISSN (Print): 2046-2069

Ratings:
Scopus rating (2016): CiteScore 3.06 SJR 0.875 SNIP 0.743
Scopus rating (2015): SJR 0.959 SNIP 0.837 CiteScore 3.42
Scopus rating (2014): SJR 1.114 SNIP 0.965 CiteScore 3.87
Scopus rating (2013): SJR 1.117 SNIP 0.903 CiteScore 3.74
Scopus rating (2012): SJR 0.863 SNIP 0.603 CiteScore 2.4
Original language: English
DOIs:
10.1039/c4ra03105a

Tetraiodoethynyl resorcinarene cavitands as multivalent halogen bond donors

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Turunen, L., Beyeh, N. K., Pan, F., Valkonen, A., Rissanen, K.
Number of pages: 4
Pages: 15920-15923
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Chemical Communications
Volume: 50
Issue number: 100
ISSN (Print): 1359-7345

Ratings:
Scopus rating (2016): CiteScore 6.06 SJR 2.506 SNIP 1.159
Scopus rating (2015): SJR 2.664 SNIP 1.314 CiteScore 6.7
Scopus rating (2014): SJR 2.701 SNIP 1.446 CiteScore 6.83
Scopus rating (2013): SJR 2.755 SNIP 1.38 CiteScore 6.73
The effect of diketopyrrolopyrrole (DPP) group inclusion in p-cyanophenyl end-capped oligothiophene used as a dopant in P3HT:PCBM BHJ solar cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Manninen, V., Heiskanen, J., Pankov, D., Kastinen, T., Hukka, T., Hormi, O., Lemmetyinen, H.
Number of pages: 13
Pages: 1456-1468
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Photochemical & Photobiological Sciences
Volume: 13
Issue number: 10
ISSN (Print): 1474-905X
Ratings:
Scopus rating (2016): SJR 0.722 SNIP 0.799 CiteScore 2.37
Scopus rating (2015): SJR 0.805 SNIP 0.811 CiteScore 2.4
Scopus rating (2014): SJR 0.874 SNIP 0.946 CiteScore 2.55
Scopus rating (2013): SJR 0.989 SNIP 1.006 CiteScore 3
Scopus rating (2012): SJR 1.049 SNIP 0.919 CiteScore 2.73
Scopus rating (2011): SJR 1.013 SNIP 0.962 CiteScore 2.63
Scopus rating (2010): SJR 1.082 SNIP 0.927
Scopus rating (2009): SJR 0.983 SNIP 1.115
Scopus rating (2008): SJR 0.936 SNIP 0.872
Scopus rating (2007): SJR 1.09 SNIP 0.957
Scopus rating (2006): SJR 0.838 SNIP 0.914
Scopus rating (2005): SJR 0.938 SNIP 1.061
Scopus rating (2004): SJR 0.667 SNIP 1.098
Scopus rating (2003): SJR 0.492 SNIP 0.793
The effect of thiophene substituents of fulleropyrrolidine acceptors on the performance of inverted organic solar cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Number of pages: 8
Pages: 193-200
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Synthetic Metals
Volume: 195
ISSN (Print): 0379-6779
Ratings:
Scopus rating (2016): SJR 0.675 SNIP 0.764 CiteScore 2.45
Scopus rating (2015): SJR 0.643 SNIP 0.75 CiteScore 2.27
Scopus rating (2014): SJR 0.711 SNIP 0.943 CiteScore 2.42
Scopus rating (2013): SJR 0.721 SNIP 0.961 CiteScore 2.48
Scopus rating (2012): SJR 0.842 SNIP 1.007 CiteScore 2.19
Scopus rating (2011): SJR 0.777 SNIP 0.916 CiteScore 2.01
Scopus rating (2010): SJR 0.808 SNIP 0.879
Scopus rating (2009): SJR 0.966 SNIP 1.083
Scopus rating (2008): SJR 1.074 SNIP 0.928
Scopus rating (2007): SJR 1.229 SNIP 0.991
Scopus rating (2006): SJR 0.92 SNIP 0.734
Scopus rating (2005): SJR 0.925 SNIP 0.793
Scopus rating (2004): SJR 0.783 SNIP 0.648
Scopus rating (2003): SJR 0.88 SNIP 0.885
Scopus rating (2002): SJR 0.944 SNIP 0.683
Scopus rating (2001): SJR 0.786 SNIP 0.871
Scopus rating (2000): SJR 0.631 SNIP 0.558
Scopus rating (1999): SJR 0.864 SNIP 0.933
Original language: English
DOI: 10.1016/j.synthmet.2014.06.007

The effects of UV irradiation to polyetheretherketone fibres: Characterization by different techniques

The effects of UV irradiation on polyetheretherketone (PEEK) fibres were investigated in this study. PEEK fibres were manufactured with a melt spinning system and then artificially aged with simulated solar UV light. Fibres were then characterized by mechanical tests, Fourier transform infrared spectroscopy (FTIR), differential scanning calorimetry...
(DSC), rheology, thermogravimetric analysis (TGA) and scanning electron microscopy (SEM). PEEK, best known for its excellent thermal stability, suffered greatly from the effects of UV irradiation. The low UV stability manifested as embrittlement of the fibres in the mechanical tests, increased crosslinking rate in the rheological tests, formation of carbonyl and hydroxyl groups and changes in the nature of the carbon-hydrogen bonds in the FTIR, diminished thermal properties in TGA, and transverse cracks in the SEM photos. DSC was found to be an inaccurate technique for estimating the degradation level of PEEK fibres, whereas the carbonyl index measured by FTIR was found to be the most convenient technique. © 2014 Elsevier Ltd. All rights reserved.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Tampere University of Technology
Authors: Mylläri, V., Ruoko, T. P., Järvelä, P.
Number of pages: 7
Pages: 278-284
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Polymer Degradation and Stability
Volume: 109
ISSN (Print): 0141-3910
Ratings:
Scopus rating (2016): SJR 1.029 SNIP 1.582 CiteScore 3.57
Scopus rating (2015): SJR 1.22 SNIP 1.634 CiteScore 3.48
Scopus rating (2014): SJR 1.278 SNIP 1.888 CiteScore 3.37
Scopus rating (2013): SJR 1.341 SNIP 2.12 CiteScore 3.35
Scopus rating (2012): SJR 1.423 SNIP 2.105 CiteScore 3.25
Scopus rating (2011): SJR 1.347 SNIP 2.099 CiteScore 3.17
Scopus rating (2010): SJR 1.237 SNIP 1.642
Scopus rating (2009): SJR 1.349 SNIP 1.623
Scopus rating (2008): SJR 1.281 SNIP 1.745
Scopus rating (2007): SJR 1.451 SNIP 1.557
Scopus rating (2006): SJR 1.367 SNIP 1.787
Scopus rating (2005): SJR 1.197 SNIP 1.461
Scopus rating (2004): SJR 1.062 SNIP 1.43
Scopus rating (2003): SJR 0.922 SNIP 1.24
Scopus rating (2002): SJR 0.821 SNIP 1.058
Scopus rating (2001): SJR 0.93 SNIP 1.151
Scopus rating (2000): SJR 0.685 SNIP 1.077
Scopus rating (1999): SJR 0.75 SNIP 1.194
Original language: English
Keywords: PEEK, Fibre, Ultraviolet, Rheology, POLY(ETHER ETHER KETONE), STRUCTURE/DEGRADABILITY RELATIONSHIPS, SCANNING CALORIMETRY, THERMAL-DEGRADATION, POLYPROPYLENE, PHOTODEGRADATION, POLYMERS, PHOTOOXIDATION, CRYSTALLINITY
Electronic versions:
The_effects_of_UV_irradiation_pre-print
DOIs:
10.1016/j.polymdegradstab.2014.08.003
Links:
http://urn.fi/URN:NBN:fi:tty-201612024839
Bibliographical note
Contribution: organisation=mol,FACT1=0.8<br/>Contribution: organisation=keb,FACT2=0.2<br/>Portfolio EDEND: 2014-09-10<br/>Publisher name: Elsevier Ltd
Source: researchoutputwizard
The Wolff Rearrangement

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Chemistry and Bioengineering, Urban circular bioeconomy (UrCirBio)
Authors: Candeias, N., Trindade, A., Gois, P., Afonso, C.
Number of pages: 48
Pages: 944-991
Publication date: 2014

Host publication information
Title of host publication: Comprehensive Organic Synthesis II (Second Edition)
Place of publication: Oxford
Publisher: Elsevier
ISBN (Print): 978-0-08-097743-0
DOIs:
10.1016/B978-0-08-097742-3.00325-6

Bibliographical note
Contribution: organisation=keb,FACT1=1<br/>Portfolio EDEND: 2014-09-30
Source: researchoutputwizard
Source-ID: 205
Research output: Scientific - peer-review › Article

Ultrafast photophysical processes for Fe(III)-carboxylates

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Pozdnyakov, I. P., Melnikov, A. A., Tkachenko, N., Chekalin, S. V., Lemmetyinen, H., Plyusnin, V. F.
Number of pages: 6
Pages: 17590-17595
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Dalton Transactions
Volume: 43
Issue number: 47
ISSN (Print): 1477-9234
Ratings:
Scopus rating (2016): SJR 1.243 SNIP 0.931 CiteScore 3.85
Scopus rating (2015): SJR 1.351 SNIP 1.026 CiteScore 4.1
Scopus rating (2014): SJR 1.413 SNIP 1.085 CiteScore 4.06
Scopus rating (2013): SJR 1.436 SNIP 1.083 CiteScore 4.07
Scopus rating (2012): SJR 1.554 SNIP 1.001 CiteScore 3.79
Scopus rating (2011): SJR 1.505 SNIP 1.013 CiteScore 3.68
Scopus rating (2010): SJR 1.399 SNIP 0.875
Scopus rating (2009): SJR 0.928 SNIP 0.783
Scopus rating (2008): SJR 0.629 SNIP 0.572
Scopus rating (2007): SJR 0.669 SNIP 0.539
Scopus rating (2006): SJR 1.084 SNIP 0.907
Scopus rating (2005): SJR 1.128 SNIP 0.815
Scopus rating (2004): SJR 1.045 SNIP 0.933
Scopus rating (2003): SJR 1.1 SNIP 1.051
Porphyrid in the (1010) surface of the wurtzite structure of \( \text{ZnO} \)-conformation induced effects on the electron transfer characteristics

Electron transfer at the adsorbate-surface interface is crucial in many applications but the steps taking place prior to and during the electron transfer are not always thoroughly understood. In this work a model system of 4-(porphyrin-5-yl)benzoic acid adsorbed as a corresponding benzoate on the \( \text{ZnO} \) wurtzite (1010) surface is studied using density functional theory (DFT) and time-dependent DFT. Emphasis is on the initial photoexcitation of porphyrin and on the strength of coupling between the porphyrin LUMO or LUMO + 1 and the \( \text{ZnO} \) conduction band that plays a role in the electron transfer. Firstly, \( \text{ZnO} \) wurtzite bulk is optimized to minimum energy geometry and the properties of the isolated \( \text{ZnO} \) (1010) surface model and the porphyrin model are discussed to gain insight into the combined system. Secondly, various orientations of the model porphyrin on the \( \text{ZnO} \) surface are studied: the porphyrin model standing perpendicularly to the surface and gradually brought close to the surface by tilting the linker in a few steps. The porphyrin model approaches the surface either sideways with hydrogen atoms of the porphyrin ring coming down first or twisted in a ca. 45° angle, giving rise to van der Waals (vDW) interactions are examined using Grimme’s D2 method. While the orientation affects the initial excitation of porphyrin only slightly, the coupling between the LUMO and LUMO + 1 of porphyrin and the conduction band of \( \text{ZnO} \) increases considerably if porphyrin is close to the surface, especially if the \( \pi \)-electrons are interacting with the surface. Based on the results of coupling studies, not only the distance between porphyrin and the \( \text{ZnO} \) surface but also the orientation of porphyrin can greatly affect the electron transfer. © 2013 the Owner Societies.
Bis(arylacenaphthenequinonediimine substituent effect on the properties and coordination environment of ligands and their bis-chelate AgI complexes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Papanikolaou, P., Gdaniec, M., Wicher, B., Akrivos, P. D., Tkachenko, N.
Number of pages: 10
Pages: 5196-5205
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: European Journal of Inorganic Chemistry
Volume: 2013
Issue number: 29
ISSN (Print): 1434-1948
Ratings:
Scopus rating (2016): SJR 0.791 SNIP 0.633 CiteScore 2.26
Scopus rating (2015): SJR 0.971 SNIP 0.701 CiteScore 2.58
Scopus rating (2014): SJR 1.029 SNIP 0.788 CiteScore 2.7
Scopus rating (2013): SJR 1.037 SNIP 0.78 CiteScore 2.82
Scopus rating (2012): SJR 1.188 SNIP 0.855 CiteScore 2.88
Scopus rating (2011): SJR 1.176 SNIP 0.824 CiteScore 2.81
Scopus rating (2010): SJR 1.131 SNIP 0.74
Scopus rating (2009): SJR 1.106 SNIP 0.839
Scopus rating (2008): SJR 1.116 SNIP 0.88
Scopus rating (2007): SJR 1.221 SNIP 1.027
Scopus rating (2006): SJR 1.101 SNIP 0.935
Scopus rating (2005): SJR 1.091 SNIP 0.811
Scopus rating (2004): SJR 1.02 SNIP 0.885
Scopus rating (2003): SJR 0.991 SNIP 0.863
Scopus rating (2002): SJR 1.237 SNIP 0.95
Scopus rating (2001): SJR 1.236 SNIP 1.04
Scopus rating (2000): SJR 1.098 SNIP 1.13
Scopus rating (1999): SJR 1.025 SNIP 1.097
Chain processes in the photochemistry of PtIV halide complexes in aqueous solutions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Glebov, E. M., Kolomeets, A. V., Pozdnyakov, I. P., Grivin, V. P., Plyusnin, V. F., Tkachenko, N. V., Lemmettyinen, H.
Number of pages: 9
Pages: 1540-1548
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Russian Chemical Bulletin
Volume: 62
Issue number: 7
ISSN (Print): 1066-5285
Ratings:
Scopus rating (2016): SJR 0.241 SNIP 0.45 CiteScore 0.6
Scopus rating (2015): SJR 0.251 SNIP 0.428 CiteScore 0.62
Scopus rating (2014): SJR 0.237 SNIP 0.393 CiteScore 0.47
Scopus rating (2013): SJR 0.22 SNIP 0.403 CiteScore 0.45
Scopus rating (2012): SJR 0.222 SNIP 0.301 CiteScore 0.28
Scopus rating (2011): SJR 0.19 SNIP 0.166 CiteScore 0.28
Scopus rating (2010): SJR 0.183 SNIP 0.132
Scopus rating (2009): SJR 0.181 SNIP 0.204
Scopus rating (2008): SJR 0.229 SNIP 0.221
Scopus rating (2007): SJR 0.242 SNIP 0.215
Scopus rating (2006): SJR 0.202 SNIP 0.17
Scopus rating (2005): SJR 0.219 SNIP 0.192
Scopus rating (2004): SJR 0.189 SNIP 0.189
Scopus rating (2003): SJR 0.162 SNIP 0.159
Scopus rating (2002): SJR 0.196 SNIP 0.239
Scopus rating (2001): SJR 0.211 SNIP 0.37
Scopus rating (2000): SJR 0.325 SNIP 0.453
Scopus rating (1999): SJR 0.321 SNIP 0.562

Original language: English
DOIs:
10.1007/s11172-013-0221-z
Links:

Bibliographical note
Contribution: organisation=keb,FACT1=1
Portfolio EDEND: 2014-04-29
Publisher name: Springer New York LLC
Source: researchoutputwizard
Source-ID: 2177
Research output: Scientific - peer-review › Article
Charge transfer properties of a donor-acceptor dyad based on an expanded acridinium cation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Benniston, A. C., He, X., Lemmetyinen, H., Tkachenko, N. V.
Number of pages: 8
Pages: 4995-5002
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: RSC Advances
Volume: 3
Issue number: 15
ISSN (Print): 2046-2069
Ratings:
Scopus rating (2016): CiteScore 3.06 SJR 0.875 SNIP 0.743
Scopus rating (2015): SJR 0.959 SNIP 0.837 CiteScore 3.42
Scopus rating (2014): SJR 1.114 SNIP 0.965 CiteScore 3.87
Scopus rating (2013): SJR 1.117 SNIP 0.903 CiteScore 3.74
Scopus rating (2012): SJR 0.863 SNIP 0.603 CiteScore 2.4
Original language: English
DOI: 10.1039/c3ra22813d

Bibliographical note
Contribution: organisation=keb,FACT1=1
Portfolio EDEND: 2013-10-29
Publisher name: RSC Publishing
Source: researchoutputwizard
Source-ID: 1988
Research output: Scientific - peer-review › Article

Chlorophyll tailored 20-trifluoroacetamide and its azacrown derivative as pH sensitive colorimetric sensor probe with response to AcO-, F- and CN- ions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Frontier Photonics
Authors: Iashin, V., Koso, T. V., Stranius, K., Muuronen, M., Heikkinen, S., Kavakka, J., Tkachenko, N. V., Helaja, J.
Number of pages: 4
Pages: 11485-11488
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: RSC Advances
Volume: 3
Issue number: 29
ISSN (Print): 2046-2069
Ratings:
Scopus rating (2016): CiteScore 3.06 SJR 0.875 SNIP 0.743
Scopus rating (2015): SJR 0.959 SNIP 0.837 CiteScore 3.42
Scopus rating (2014): SJR 1.114 SNIP 0.965 CiteScore 3.87
Scopus rating (2013): SJR 1.117 SNIP 0.903 CiteScore 3.74
Scopus rating (2012): SJR 0.863 SNIP 0.603 CiteScore 2.4
Original language: English
DOI: 10.1039/c3ra41741g
Complexation enhanced excited-state deactivation by lithium ion coordination to a borondipyromethylene (Bodipy) donor-bridge-acceptor dyad

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Benniston, A. C., Yang, S., Lemmetyinen, H., Tkachenko, N. V.
Number of pages: 11
Pages: 6859-6869
Publication date: 2013
Peer-reviewed: Yes

Publication information
Volume: 2013
Issue number: 30
ISSN (Print): 1434-193X
Ratings:
Scopus rating (2016): CiteScore 2.74 SJR 1.133 SNIP 0.653
Scopus rating (2015): SJR 1.198 SNIP 0.758 CiteScore 2.88
Scopus rating (2014): SJR 1.181 SNIP 0.767 CiteScore 2.96
Scopus rating (2013): SJR 1.292 SNIP 0.796 CiteScore 2.96
Scopus rating (2012): SJR 1.471 SNIP 0.811 CiteScore 2.93
Scopus rating (2011): SJR 1.536 SNIP 0.857 CiteScore 3.2
Scopus rating (2010): SJR 1.572 SNIP 0.785
Scopus rating (2009): SJR 1.497 SNIP 0.778
Scopus rating (2008): SJR 1.652 SNIP 0.759
Scopus rating (2007): SJR 1.711 SNIP 0.84
Scopus rating (2006): SJR 1.505 SNIP 0.849
Scopus rating (2005): SJR 1.246 SNIP 0.763
Scopus rating (2004): SJR 1.2 SNIP 0.81
Scopus rating (2003): SJR 1.19 SNIP 0.802
Scopus rating (2002): SJR 1.382 SNIP 0.829
Scopus rating (2001): SJR 1.159 SNIP 0.816
Scopus rating (2000): SJR 1.192 SNIP 1.048
Scopus rating (1999): SJR 0.877 SNIP 0.976
Original language: English
DOIs:
10.1002/ejoc.201300867

Conjugated donor-acceptor (D-A) copolymers in inverted organic solar cells - a combined experimental and modelling study

General information
State: Published
Demonstrating the mechanism and efficacy of water-induced shape memory and the influence of water on the thermal properties of oriented poly(d,l-lactide)

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics, Integrated Technologies for Tissue Engineering (ITTE)
Authors: Paakinaho, K., Hukka, T. I., Kastinen, T., Kellomäki, M.
Number of pages: 9
Pages: 4209-4218
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Applied Polymer Science
Volume: 130
Issue number: 6
ISSN (Print): 0021-8995
Ratings:
Scopus rating (2016): CiteScore 1.73 SJR 0.532 SNIP 0.724
Scopus rating (2015): SJR 0.574 SNIP 0.827 CiteScore 1.74
Scopus rating (2014): SJR 0.658 SNIP 0.964 CiteScore 1.76
Scopus rating (2013): SJR 0.628 SNIP 1.085 CiteScore 1.71
Scopus rating (2012): SJR 0.658 SNIP 1.081 CiteScore 1.57
Scopus rating (2011): SJR 0.601 SNIP 0.965 CiteScore 1.45
Scopus rating (2010): SJR 0.679 SNIP 0.909
Scopus rating (2009): SJR 0.697 SNIP 0.825
Scopus rating (2008): SJR 0.647 SNIP 0.822
Scopus rating (2007): SJR 0.678 SNIP 0.931
Scopus rating (2006): SJR 0.782 SNIP 1.145
Scopus rating (2005): SJR 0.779 SNIP 0.912
Determinition of preferential molecular orientation in porphyrin-fullerene dyad ZnDHD6ee monolayers by the X-ray standing-wave method and X-ray reflectometry

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Seregin, A., Dyakova, Y., Yakunin, S., Makhotkin, l., Alekseev, A., Klechkovskaya, V., Terechenko, E., Tkachenko, N., Lemmetyinen, H., Feigin, L., Kovalchuk, M.
Number of pages: 5
Pages: 934-938
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Crystallography Reports
Volume: 58
Issue number: 6
ISSN (Print): 1063-7745
Ratings:
Scopus rating (2016): SJR 0.313 SNIP 0.644 CiteScore 0.55
Scopus rating (2015): SJR 0.286 SNIP 0.583 CiteScore 0.5
Scopus rating (2014): SJR 0.307 SNIP 0.666 CiteScore 0.48
Scopus rating (2013): SJR 0.322 SNIP 0.636 CiteScore 0.4
Scopus rating (2012): SJR 0.384 SNIP 0.65 CiteScore 0.45
Scopus rating (2011): SJR 0.215 SNIP 0.333 CiteScore 0.29
Scopus rating (2010): SJR 0.477 SNIP 0.583
Scopus rating (2009): SJR 0.189 SNIP 0.3
Scopus rating (2008): SJR 0.22 SNIP 0.202
Scopus rating (2007): SJR 0.148 SNIP 0.188
Scopus rating (2006): SJR 0.236 SNIP 0.62
Scopus rating (2005): SJR 0.262 SNIP 0.641
Scopus rating (2004): SJR 0.209 SNIP 0.446
Scopus rating (2003): SJR 0.181 SNIP 0.292
Scopus rating (2002): SJR 0.128 SNIP 0.132
Scopus rating (2001): SJR 0.222 SNIP 0.34
Scopus rating (2000): SJR 0.258 SNIP 0.399
Scopus rating (1999): SJR 0.136 SNIP 0.157
Original language: English
DOIs:
10.1134/S1063774513060205
Dipyrrolidinyl-substituted perylene diimide as additive for poly(3-hexylthiophene) : [6,6]-Phenyl C61 butyric acid methylester bulk-heterojunction blends

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Vivo, P., Dubey, R., Lehtonen, E., Kivistö, H., Vuorinen, T., Lemmetyinen, H.
Number of pages: 8
Pages: 398-405
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Thin Solid Films
Volume: 548
ISSN (Print): 0040-6090
Ratings:
Scopus rating (2016): CiteScore 1.83 SJR 0.64 SNIP 0.897
Scopus rating (2015): SJR 0.705 SNIP 0.98 CiteScore 1.84
Scopus rating (2014): SJR 0.73 SNIP 1.115 CiteScore 1.94
Scopus rating (2013): SJR 0.818 SNIP 1.215 CiteScore 2
Scopus rating (2012): SJR 0.899 SNIP 1.162 CiteScore 1.86
Scopus rating (2011): SJR 0.995 SNIP 1.337 CiteScore 2.13
Scopus rating (2010): SJR 1.141 SNIP 1.235
Scopus rating (2009): SJR 1.142 SNIP 1.221
Scopus rating (2008): SJR 1.191 SNIP 1.282
Scopus rating (2006): SJR 1.147 SNIP 1.318
Scopus rating (2005): SJR 1.173 SNIP 1.246
Scopus rating (2004): SJR 1.188 SNIP 1.308
Scopus rating (2003): SJR 1.231 SNIP 1.282
Scopus rating (2002): SJR 1.175 SNIP 1.14
Scopus rating (2001): SJR 1.032 SNIP 1.032
Scopus rating (2000): SJR 0.99 SNIP 0.924
Scopus rating (1999): SJR 0.914 SNIP 0.862
Original language: English
DOIs:
10.1016/j.tsf.2013.08.106

Bibliographical note
Available online 7 September 2013
Contribution: organisation=keb,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher: Elsevier
Source: researchoutputwizard
Source-ID: 3716
Research output: Scientific - peer-review

Direct evidence of significantly different chemical behavior and excited-state dynamics of 1,7- and 1,6-regioisomers of pyrrolidinyl-substituted perylene diimide

General information
State: Published
Effect of anion coordination on electron transfer in double-linked zinc phthalocyanine-fullerene dyad
Excited-state interaction of red and green perylene diimides with luminescent Ru(II) polypyridine complex

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Dubey, R. K., Niemi, M., Kaunisto, K., Stranius, K., Efimov, A., Tkachenko, N., Lemmetyinen, H.
Number of pages: 13
Pages: 9761-9773
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Inorganic Chemistry
Volume: 52
ISSN (Print): 0020-1669
Ratings:
Scopus rating (2016): SJR 1.774 SNIP 1.198 CiteScore 4.64
Scopus rating (2015): SJR 1.805 SNIP 1.239 CiteScore 4.7
Scopus rating (2014): SJR 1.869 SNIP 1.314 CiteScore 4.69
Scopus rating (2013): SJR 1.819 SNIP 1.379 CiteScore 4.9
Scopus rating (2012): SJR 2.08 SNIP 1.35 CiteScore 4.72
Scopus rating (2011): SJR 1.952 SNIP 1.373 CiteScore 4.64
Scopus rating (2010): SJR 1.98 SNIP 1.323
Scopus rating (2009): SJR 1.982 SNIP 1.47
Scopus rating (2008): SJR 2.025 SNIP 1.412
Scopus rating (2007): SJR 2.136 SNIP 1.544
Scopus rating (2006): SJR 1.828 SNIP 1.508
Scopus rating (2005): SJR 2.012 SNIP 1.46
Fluorescence properties of the chromophore-binding domain of bacteriophytochrome from Deinococcus radiodurans

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Lehtivuori, H., Rissanen, I., Takala, H., Bamford, J., Tkachenko, N. V., Ihalainen, J. A.
Pages: 11049-11057
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry Part B
Volume: 117
ISSN (Print): 1520-6106
Ratings:
Scopus rating (2016): CiteScore 3.03 SJR 1.348 SNIP 1.02
Scopus rating (2015): SJR 1.367 SNIP 1.096 CiteScore 3.25
Scopus rating (2014): SJR 1.44 SNIP 1.14 CiteScore 3.28
Scopus rating (2013): SJR 1.494 SNIP 1.2 CiteScore 3.53
Scopus rating (2012): SJR 1.92 SNIP 1.251 CiteScore 3.66
Scopus rating (2011): SJR 1.78 SNIP 1.226 CiteScore 3.62
Scopus rating (2010): SJR 1.849 SNIP 1.214
Scopus rating (2009): SJR 2.232 SNIP 1.349
Scopus rating (2008): SJR 2.543 SNIP 1.381
Scopus rating (2007): SJR 2.346 SNIP 1.282
Scopus rating (2006): SJR 2.369 SNIP 1.415
Scopus rating (2005): SJR 2.275 SNIP 1.474
Scopus rating (2004): SJR 2.148 SNIP 1.511
Scopus rating (2003): SJR 2.034 SNIP 1.47
Scopus rating (2002): SJR 2.118 SNIP 1.496
Scopus rating (2001): SJR 2.053 SNIP 1.508
Scopus rating (2000): SJR 2.145 SNIP 1.527
Scopus rating (1999): SJR 1.713 SNIP 1.8
Original language: English
DOIs:
10.1021/jp109906b
10.1021/jp312061b

Bibliographical note
Contribution: organisation=keb,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: American Chemical Society
Hydrolytic degradation of composites of poly(L-lactide-co-epsilon-caprolactone) 70/30 and beta-tricalcium phosphate

There is an increasing need for synthetic bone substitute materials that decrease the need for allografts and autografts. In this study, composites of β-TCP and a biodegradable poly(L-lactide-co-ε-caprolactone) were manufactured using extrusion to form biodegradable composites with high β-TCP contents for osteoconductivity. The hydrolytic degradation of the composites containing 0, 10, 20, 35 and 50% of β-TCP was studied in vitro for 52 weeks. During the study, it was observed that β-TCP did not have an effect on the degradation rate of the polymer matrix. However, the crystallinity of the materials increased throughout the test series and changes in Tgs were also observed as the cromonomer ratio of the polymer matrix changed as the degradation proceeded. The results show that the materials have desirable degradation
properties and, thus, possess great potential as bioabsorbable and osteoconductive bone filling materials.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Biomedical Engineering, Department of Chemistry and Bioengineering, Frontier Photonics, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Ahola, N., Veiranto, M., Rich, J., Efimov, A., Hannula, M., Seppälä, J., Kellomäki, M.
Publication date: 2013
Peer-reviewed: Yes

**Publication information**
Journal: Journal of Biomaterials Applications
Volume: 28
Issue number: 4
ISSN (Print): 0885-3282
Ratings:
Scopus rating (2016): SJR 0.554 SNIP 0.76 CiteScore 2.24
Scopus rating (2015): SJR 0.634 SNIP 0.755 CiteScore 2.15
Scopus rating (2014): SJR 0.659 SNIP 1.004 CiteScore 2.53
Scopus rating (2013): SJR 0.72 SNIP 1.026 CiteScore 2.35
Scopus rating (2012): SJR 0.792 SNIP 0.958 CiteScore 2.08
Scopus rating (2011): SJR 0.804 SNIP 1.089 CiteScore 2.16
Scopus rating (2010): SJR 0.921 SNIP 1.068
Scopus rating (2009): SJR 0.67 SNIP 1.082
Scopus rating (2008): SJR 0.603 SNIP 0.758
Scopus rating (2007): SJR 0.682 SNIP 0.801
Scopus rating (2006): SJR 0.585 SNIP 0.823
Scopus rating (2005): SJR 0.327 SNIP 0.591
Scopus rating (2004): SJR 0.354 SNIP 0.446
Scopus rating (2003): SJR 0.436 SNIP 0.514
Scopus rating (2002): SJR 0.597 SNIP 0.875
Scopus rating (2001): SJR 0.553 SNIP 0.896
Scopus rating (2000): SJR 0.417 SNIP 0.583
Scopus rating (1999): SJR 0.228 SNIP 0.556
Original language: English
Electronic versions:
ahola_hydrolytic_degradation_of_composites.pdf
DOIs:
10.1177/0885328212462258
Links:
http://jba.sagepub.com/content/early/2012/10/09/0885328212462258
http://urn.fi/URN:NBN:fi:tty-201401291066

**Bibliographical note**
Online First: Published online before print October 9, 2012, doi: 10.1177/0885328212462258 : J Biomater Appl October 9, 2012 0885328212462258<br/>Contribution: organisation=bme,FACT1=0.5<br/>Contribution: organisation=keb kem,FACT2=0.5<br/>Publisher name: Sage
Source: researchoutputwizard
Source-ID: 1887
Research output: Scientific - peer-review › Article

**Independent versus cooperative binding in polyethylenimine-DNA and poly(L-lysine)-DNA polyplexes**

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Influence of plasma chemistry on impurity incorporation in AlN prepared by plasma enhanced atomic layer deposition

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Frontier Photonics
Authors: Pyymaki Perros, A., Hakola, H., Sajavaara, T., Huhtio, T., Lipsanen, H.
Number of pages: 8
Publication date: 2013
Peer-reviewed: Yes

Publication information
Volume: 46
Issue number: 50
Article number: 505502
ISSN (Print): 0022-3727
Ratings:
Scopus rating (2016): CiteScore 2.07 SJR 0.645 SNIP 0.917
Molecular dipole effects on tuning electron transfer in a porphine-quinone complex: A DFT and TDDFT study

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Chemistry and Bioengineering, Department of Physics, Research group: Supramolecular photochemistry, Computational Science X (CompX), Frontier Photonics
Authors: Cramariuc, O., Aittala, P., Hukka, T.
Pages: 697-704
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Molecular Modeling
Volume: 19
Issue number: 2
ISSN (Print): 1610-2940
Ratings:
Scopus rating (2016): SJR 0.447 SNIP 0.482 CiteScore 1.23
Scopus rating (2015): SJR 0.454 SNIP 0.589 CiteScore 1.35
Scopus rating (2014): SJR 0.51 SNIP 0.727 CiteScore 1.69
Scopus rating (2013): SJR 0.523 SNIP 0.734 CiteScore 1.94
Scopus rating (2012): SJR 0.571 SNIP 0.679 CiteScore 1.66
Scopus rating (2011): SJR 0.52 SNIP 0.773 CiteScore 1.7
Scopus rating (2010): SJR 0.919 SNIP 1.148
Scopus rating (2009): SJR 0.752 SNIP 1.025
Scopus rating (2008): SJR 0.75 SNIP 0.719
Scopus rating (2007): SJR 0.637 SNIP 0.75
Scopus rating (2006): SJR 0.466 SNIP 0.532
Molecular weight distribution of a full-scale landfill leachate treatment by membrane bioreactor and nanofiltration membrane

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Campagna, M., Cakmakci, M., Busra Yaman, F., Özkaya, B.
Number of pages: 5
Pages: 866-870
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Waste Management
Volume: 33
Issue number: 4
ISSN (Print): 0956-053X
Ratings:
Scopus rating (2016): CiteScore 4 SJR 1.354 SNIP 2.044
Scopus rating (2015): SJR 1.739 SNIP 2.256 CiteScore 4.33
Scopus rating (2014): SJR 1.777 SNIP 2.482 CiteScore 3.43
Scopus rating (2013): SJR 1.822 SNIP 2.435 CiteScore 3.39
Scopus rating (2012): SJR 1.611 SNIP 2.184 CiteScore 2.91
Scopus rating (2011): SJR 1.698 SNIP 2.085 CiteScore 2.99
Scopus rating (2010): SJR 1.555 SNIP 1.78
Scopus rating (2009): SJR 1.502 SNIP 1.899
Scopus rating (2008): SJR 1.378 SNIP 2.13
Scopus rating (2007): SJR 1.035 SNIP 1.767
Scopus rating (2006): SJR 1.046 SNIP 1.749
Scopus rating (2005): SJR 1.059 SNIP 1.65
Scopus rating (2004): SJR 1.289 SNIP 1.939
Scopus rating (2003): SJR 0.847 SNIP 1.269
Scopus rating (2002): SJR 0.561 SNIP 0.874
Scopus rating (2001): SJR 0.456 SNIP 0.696
Scopus rating (2000): SJR 0.271 SNIP 0.451
Scopus rating (1999): SJR 0.262 SNIP 0.479
Original language: English
DOIs:
10.1016/j.wasman.2012.12.010
Photophysics of bis(ethylxanthato)nickel(II) [Ni(EtOCS2)2] complex studied by femtosecond pump-probe spectroscopy

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Plyusnin, V., Kolomeets, A., Budkina, D., Pozdnyakov, I., Tkachenko, N., Lemmetyinen, H.
Number of pages: 6
Pages: 57-62
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Photochemistry and Photobiology, A: Chemistry
Volume: 251
Issue number: 1
ISSN (Print): 1010-6030
Ratings:
Scopus rating (2016): SJR 0.732 SNIP 0.841 CiteScore 2.6
Scopus rating (2015): SJR 0.72 SNIP 0.86 CiteScore 2.47
Scopus rating (2014): SJR 0.782 SNIP 0.97 CiteScore 2.39
Scopus rating (2013): SJR 0.818 SNIP 1.006 CiteScore 2.5
Scopus rating (2012): SJR 0.919 SNIP 1.116 CiteScore 2.51
Scopus rating (2011): SJR 0.97 SNIP 1.342 CiteScore 2.84
Scopus rating (2010): SJR 1.021 SNIP 1.05
Scopus rating (2009): SJR 1.163 SNIP 1.191
Scopus rating (2008): SJR 1.04 SNIP 1.137
Scopus rating (2007): SJR 1.175 SNIP 1.364
Scopus rating (2006): SJR 0.996 SNIP 1.263
Scopus rating (2005): SJR 1.102 SNIP 1.436
Scopus rating (2004): SJR 0.952 SNIP 1.213
Scopus rating (2003): SJR 0.76 SNIP 0.987
Scopus rating (2002): SJR 0.646 SNIP 0.864
Scopus rating (2001): SJR 0.572 SNIP 0.934
Scopus rating (2000): SJR 0.782 SNIP 0.945
Scopus rating (1999): SJR 0.666 SNIP 1.047
Original language: English
DOIs:
10.1016/j.jphotochem.2012.08.005

Plasma-assisted chemical vapor deposition of Fe:TiO2 films for photoelectrochemical hydrogen production

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Probing the excited state dynamics of a new family of Cu(I)-complexes with an enhanced light absorption capacity: excitation-wavelength dependent population of states through branching

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Frontier Photonics
Authors: Papanikolaou, P., Tkachenko, N.
Number of pages: 9
Pages: 13128-13136
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Physical Chemistry Chemical Physics
Volume: 15
Issue number: 31
ISSN (Print): 1463-9076
Ratings:
Scopus rating (2016): CiteScore 4.06 SJR 1.678 SNIP 1.117
Scopus rating (2015): SJR 1.771 SNIP 1.244 CiteScore 4.45
Scopus rating (2014): SJR 1.772 SNIP 1.253 CiteScore 4.29
Scopus rating (2013): SJR 1.715 SNIP 1.216 CiteScore 4.05
Scopus rating (2012): SJR 1.916 SNIP 1.184 CiteScore 3.67
Scopus rating (2011): SJR 1.697 SNIP 1.203 CiteScore 3.6
Scopus rating (2010): SJR 1.802 SNIP 1.196
Scopus rating (2009): SJR 2.127 SNIP 1.369
Scopus rating (2008): SJR 2.158 SNIP 1.211
Scopus rating (2007): SJR 1.84 SNIP 1.138
Scopus rating (2006): SJR 1.467 SNIP 1.128
Scopus rating (2005): SJR 1.389 SNIP 1.104
Scopus rating (2004): SJR 1.173 SNIP 1.007
Scopus rating (2003): SJR 1.093 SNIP 0.925
Scopus rating (2002): SJR 1.122 SNIP 0.973
Scopus rating (2001): SJR 1.09 SNIP 0.914
Scopus rating (2000): SJR 0.948 SNIP 1.068
Ring-expansion reaction of isatins with ethyl diazoacetate catalyzed by dirhodium(II)/DBU metal-organic system: En route to viridicatin alkaloids

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Urban circular bioeconomy (UrCirBio)
Authors: Paterna, R., Andre, V., Duarte, M. T., Veiros, L. F., Rafael Candeias, N., Gois, P. M.
Number of pages: 11
Pages: 6280-6290
Publication date: 2013
Peer-reviewed: Yes

Publication information
Volume: 2013
Issue number: 28
ISSN (Print): 1434-193X
Ratings:
Scopus rating (2016): CiteScore 2.74 SJR 1.133 SNIP 0.653
Scopus rating (2015): SJR 1.198 SNIP 0.758 CiteScore 2.88
Scopus rating (2014): SJR 1.181 SNIP 0.767 CiteScore 2.96
Scopus rating (2013): SJR 1.292 SNIP 0.796 CiteScore 2.96
Scopus rating (2012): SJR 1.471 SNIP 0.811 CiteScore 2.93
Scopus rating (2011): SJR 1.536 SNIP 0.857 CiteScore 3.2
Scopus rating (2010): SJR 1.572 SNIP 0.785
Scopus rating (2009): SJR 1.497 SNIP 0.778
Scopus rating (2008): SJR 1.652 SNIP 0.759
Scopus rating (2007): SJR 1.711 SNIP 0.84
Scopus rating (2006): SJR 1.505 SNIP 0.849
Scopus rating (2005): SJR 1.246 SNIP 0.763
Scopus rating (2004): SJR 1.2 SNIP 0.81
Scopus rating (2003): SJR 1.19 SNIP 0.802
Scopus rating (2002): SJR 1.382 SNIP 0.829
Scopus rating (2001): SJR 1.159 SNIP 0.816
Scopus rating (2000): SJR 1.192 SNIP 1.048
Scopus rating (1999): SJR 0.877 SNIP 0.976
Original language: English
DOIs:
10.1002/ejoc.201300796

Bibliographical note
Contribution: organisation=keb,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Wiley
Source: researchoutputwizard
Source-ID: 3106
Research output: Scientific - peer-review » Article

Sequential photoinduced energy and electron transfer directed improved performance of the supramolecular solar cell of a zinc porphyrin - zinc phthalocyanine conjugate modified TiO2 surface
Short synthesis of the natural product 3β-hydroxy-labd-8(17)-en-15-oic acid via microbial transformation of labdanolic acid

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Number of pages: 11
Pages: 763-773
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 117
ISSN (Print): 1932-7447
Ratings:
Scopus rating (2016): CiteScore 4.48 SJR 1.948 SNIP 1.181
Scopus rating (2015): SJR 1.917 SNIP 1.268 CiteScore 4.68
Scopus rating (2014): SJR 2.027 SNIP 1.448 CiteScore 5.08
Scopus rating (2013): SJR 2.134 SNIP 1.439 CiteScore 5.14
Scopus rating (2012): SJR 2.514 SNIP 1.46 CiteScore 4.98
Scopus rating (2011): SJR 2.32 SNIP 1.457 CiteScore 4.92
Scopus rating (2010): SJR 2.438 SNIP 1.356
Scopus rating (2009): SJR 2.128 SNIP 1.417
Scopus rating (2008): SJR 1.856 SNIP 1.033
Original language: English
DOIs:
10.1021/jp308923e

Bibliographical note
Contribution: organisation=keb,FACT1=1<br/>Portfolio EDEND: 2013-10-29
Source: researchoutputwizard
Source-ID: 2538
Research output: Scientific - peer-review › Article

Short synthesis of the natural product 3β-hydroxy-labd-8(17)-en-15-oic acid via microbial transformation of labdanolic acid

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Urban circular bioeconomy (UrCirBio), Former organisation of the author
Number of pages: 5
Pages: 165-169
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Phytochemistry Letters
Volume: 6
Issue number: 2
ISSN (Print): 1874-3900
Ratings:
Scopus rating (2016): SJR 0.543 SNIP 0.81 CiteScore 1.49
Scopus rating (2015): SJR 0.524 SNIP 0.852 CiteScore 1.51
Scopus rating (2014): SJR 0.592 SNIP 1.072 CiteScore 1.53
Scopus rating (2013): SJR 0.647 SNIP 1.014 CiteScore 1.57
Scopus rating (2012): SJR 0.545 SNIP 0.944 CiteScore 1.37
Scopus rating (2011): SJR 0.544 SNIP 0.776 CiteScore 1.42
Scopus rating (2010): SJR 0.468 SNIP 1.038
Studies on the structure of coumarin-modified dextran nanoparticles by fluorescence spectroscopy

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Wondraczek, H., Kotiaho, A., Niemi, M., Fardim, P., Heinze, T.
Number of pages: 7
Pages: 45-51
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Carbohydrate Polymers
Volume: 97
Issue number: 1
ISSN (Print): 0144-8617
Ratings:
Scopus rating (2016): SJR 1.404 SNIP 1.745 CiteScore 5.15
Scopus rating (2015): SJR 1.46 SNIP 1.842 CiteScore 4.86
Scopus rating (2014): SJR 1.584 SNIP 1.969 CiteScore 4.69
Scopus rating (2013): SJR 1.346 SNIP 1.967 CiteScore 4.39
Scopus rating (2012): SJR 1.409 SNIP 2.045 CiteScore 3.93
Scopus rating (2011): SJR 1.287 SNIP 1.991 CiteScore 4.08
Scopus rating (2010): SJR 1.372 SNIP 1.808
Scopus rating (2009): SJR 1.43 SNIP 1.718
Scopus rating (2008): SJR 1.142 SNIP 1.515
Scopus rating (2007): SJR 0.879 SNIP 1.369
Scopus rating (2006): SJR 0.824 SNIP 1.424
Scopus rating (2005): SJR 0.816 SNIP 1.349
Scopus rating (2004): SJR 0.885 SNIP 1.538
Scopus rating (2003): SJR 0.937 SNIP 1.41
Scopus rating (2002): SJR 0.878 SNIP 1.372
Scopus rating (2001): SJR 0.828 SNIP 1.062
Scopus rating (2000): SJR 0.858 SNIP 1.086
Scopus rating (1999): SJR 0.764 SNIP 1.074
Original language: English
DOIs:
10.1016/j.carbpol.2013.04.040

Bibliographical note
Contribution: organisation=keb,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Pergamon
Source: researchoutputwizard
Source-ID: 3748
Research output: Scientific - peer-review › Article

Study of structural order in porphyrin-fullerene dyad ZnDHD6ee monolayers by electron diffraction and atomic force microscopy

General information
State: Published
Supramolecular assemblies of bay-substituted perylene diimides in solution and on a solid substrate

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Sariola-Leikas, E., Niemi, M., Lemmetyinen, H., Efimov, A.
Number of pages: 10
Pages: 6397-6406
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Organic and Biomolecular Chemistry
Volume: 11
The Effect and Role of Carbon Atoms in Poly(ß-amino ester)s for DNA Binding and Gene Delivery

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Bishop, C. J., Ketola, T., Tzeng, S. Y., Sunshine, J. C., Urtti, A., Lemmetyinen, H., Vuorimaa-Laukkanen, E., Yliperttula, M., Green, J. J.
Number of pages: 7
Pages: 6951-6957
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: JOURNAL OF THE AMERICAN CHEMICAL SOCIETY
Volume: 135
Issue number: 18
ISSN (Print): 0002-7863
Ratings:
Scopus rating (2016): SJR 7.368 SNIP 2.584 CiteScore 13.18
Scopus rating (2015): SJR 6.826 SNIP 2.632 CiteScore 12.81
Scopus rating (2014): SJR 6.273 SNIP 2.578 CiteScore 11.92
Scopus rating (2013): SJR 5.953 SNIP 2.455 CiteScore 11.38
Scopus rating (2012): SJR 6.141 SNIP 2.379 CiteScore 10.37
Scopus rating (2011): SJR 5.447 SNIP 2.336 CiteScore 9.94
Scopus rating (2010): SJR 5.076 SNIP 2.132
Scopus rating (2009): SJR 4.883 SNIP 2.176
Scopus rating (2008): SJR 4.936 SNIP 2.116
Scopus rating (2007): SJR 5.023 SNIP 2.126
Scopus rating (2006): SJR 4.546 SNIP 2.22
Scopus rating (2005): SJR 4.284 SNIP 2.207
Triarylamine-substituted imidazole- and quinoxaline-fused push-pull porphyrins for dye-sensitized solar cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Supramolecular photochemistry, Department of Chemistry and Bioengineering, Frontier Photonics
Authors: Hayashi, H., Touchy, A. S., Kinjo, Y., Kurotobi, K., Toude, Y., Ito, S., Saarenpää, H., Tkachenko, N., Lemmetyinen, H., Imahori, H.
Number of pages: 10
Pages: 508-517
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: ChemSusChem
Volume: 6
Issue number: 3
ISSN (Print): 1864-5631
Ratings:
Scopus rating (2016): SJR 2.385 SNIP 1.276 CiteScore 6.7
Scopus rating (2015): SJR 2.494 SNIP 1.411 CiteScore 7.33
Scopus rating (2014): SJR 2.863 SNIP 1.663 CiteScore 7.97
Scopus rating (2013): SJR 2.548 SNIP 1.452 CiteScore 6.79
Scopus rating (2012): SJR 3.046 SNIP 1.563 CiteScore 6.72
Scopus rating (2011): SJR 2.767 SNIP 1.504 CiteScore 5.53
Scopus rating (2010): SJR 1.945 SNIP 1.134
Scopus rating (2009): SJR 0.973 SNIP 0.72
Scopus rating (2008): SJR 0.291 SNIP 0.48
Scopus rating (2007): SJR 0.273 SNIP 0.495
Scopus rating (2006): SJR 0.243 SNIP 0.372
Scopus rating (2005): SJR 0.195 SNIP 0.285
Scopus rating (2004): SJR 0.214 SNIP 0.276
Scopus rating (2003): SJR 0.276 SNIP 0.419
Scopus rating (2002): SJR 0.312 SNIP 0.586
Scopus rating (2001): SJR 0.292 SNIP 0.496
Scopus rating (2000): SJR 0.422 SNIP 0.556
Scopus rating (1999): SJR 0.511 SNIP 0.708
Original language: English
DOIs:
10.1002/cssc.201200869
Tuning the Förster overlap integral: energy transfer over 20 Ångstroms from a pyrene-based donor to borondipyrromethene (Bodipy)

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Bai, D., Benniston, A., Hagon, J., Lemmetyinen, H., Tkachenko, N., Harrington, R.
Number of pages: 8
Pages: 9854-9861
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Physical Chemistry Chemical Physics
Volume: 15
Issue number: 24
ISSN (Print): 1463-9076
Ratings:
Scopus rating (2016): CiteScore 4.06 SJR 1.678 SNIP 1.117
Scopus rating (2015): SJR 1.771 SNIP 1.244 CiteScore 4.45
Scopus rating (2014): SJR 1.772 SNIP 1.253 CiteScore 4.29
Scopus rating (2013): SJR 1.715 SNIP 1.216 CiteScore 4.05
Scopus rating (2012): SJR 1.916 SNIP 1.184 CiteScore 3.67
Scopus rating (2011): SJR 1.697 SNIP 1.203 CiteScore 3.6
Scopus rating (2010): SJR 1.602 SNIP 1.196
Scopus rating (2009): SJR 2.127 SNIP 1.369
Scopus rating (2008): SJR 2.158 SNIP 1.211
Scopus rating (2007): SJR 1.84 SNIP 1.138
Scopus rating (2006): SJR 1.467 SNIP 1.128
Scopus rating (2005): SJR 1.389 SNIP 1.104
Scopus rating (2004): SJR 1.173 SNIP 1.007
Scopus rating (2003): SJR 1.093 SNIP 0.925
Scopus rating (2002): SJR 1.122 SNIP 0.973
Scopus rating (2001): SJR 1.09 SNIP 0.914
Scopus rating (2000): SJR 0.948 SNIP 1.068
Scopus rating (1999): SJR 0.121 SNIP 0
Original language: English
DOIs:
10.1039/c3cp50173f

Algorithm for In Silico Optimization of Production Strains

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
A Photoconductive, Thiophene-Fullerene Double-Cable Polymer, Nanorod Device

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Pages: 478-481
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry Letters
Volume: 3
Issue number: 4
ISSN (Print): 1948-7185

Ratings:
Scopus rating (2016): CiteScore 8.18 SJR 4.583 SNIP 1.68
Scopus rating (2015): SJR 4.233 SNIP 1.829 CiteScore 8.04
Scopus rating (2014): SJR 3.722 SNIP 1.724 CiteScore 7
Scopus rating (2013): SJR 3.515 SNIP 1.61 CiteScore 6.61
Scopus rating (2012): SJR 3.943 SNIP 1.751 CiteScore 6.3
Scopus rating (2011): SJR 3.244 SNIP 1.602 CiteScore 5.95
Original language: English
DOIs:
10.1021/jz300015e

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Publisher name: American Chemical Society - ACS
Source: researchoutputwizard
Source-ID: 4305
Research output: Scientific - peer-review › Article
Car-parrinello molecular dynamics study of a porphyrin-fullerene electron donor-acceptor dyad

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Research area: Computational Physics, Department of Chemistry and Bioengineering, Department of Physics
Authors: Karilainen, T., Cramariuc, O., Tappura, K., Hukka, T.
Number of pages: 1
Pages: 1-1
Publication date: 2012

Host publication information
Title of host publication: Physics Days 2012, the 46th annual meeting of the Finnish Physical Society, 13.-15.3.2012, Joensuu, Finland
Place of publication: Joensuu
Publisher: University of Eastern Finland; Suomen fyysikkoseura

Publication series
Name: Physics Days / Fysiikan päivät : Annual Meeting of the Finnish Physical Society
Links: http://www.uef.fi/c/document_library/get_file?uuid=41e478a5-dda0-49bf-90e0-e4013cc1196d&groupId=1326215&p_l_id=1326219

Bibliographical note
**Donor-acceptor alternating copolymer based on thermally converted isothianaphthene dimer and thiazolothiazole subunits**

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Umeyama, T., Hirose, K., Noda, K., Matsushige, K., Shishido, T., Saarenpää, H., Tkachenko, N. V., Lemmetyinen, H., Ono, N., Imahori, H.
Pages: 17414-17423
Publication date: 2012
Peer-reviewed: Yes

**Publication information**
Journal: Journal of Physical Chemistry C
Volume: 116
Issue number: 33
ISSN (Print): 1932-7447

Ratings:
Scopus rating (2016): CiteScore 4.48 SJR 1.948 SNIP 1.181
Scopus rating (2015): SJR 1.917 SNIP 1.268 CiteScore 4.68
Scopus rating (2014): SJR 2.027 SNIP 1.448 CiteScore 5.08
Scopus rating (2013): SJR 2.134 SNIP 1.439 CiteScore 5.14
Scopus rating (2012): SJR 2.514 SNIP 1.46 CiteScore 4.98
Scopus rating (2011): SJR 2.32 SNIP 1.457 CiteScore 4.92
Scopus rating (2010): SJR 2.438 SNIP 1.356
Effect of halide binding on intramolecular exciplex of double-linked zinc porphyrin-fullerene dyad

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Al-Subi, A. H., Niemi, M., Ranta, J., Tkachenko, N. V., Lemmetyinen, H.
Pages: 164-168
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Chemical Physics Letters
Volume: 531
ISSN (Print): 0009-2614
Ratings:
Scopus rating (2016): SJR 0.726 SNIP 0.721 CiteScore 1.71
Scopus rating (2015): SJR 0.733 SNIP 0.747 CiteScore 1.83
Scopus rating (2014): SJR 0.757 SNIP 0.773 CiteScore 1.83
Scopus rating (2013): SJR 0.856 SNIP 0.844 CiteScore 2.07
Scopus rating (2012): SJR 1.101 SNIP 0.916 CiteScore 2.2
Scopus rating (2011): SJR 1.156 SNIP 1.013 CiteScore 2.38
Scopus rating (2010): SJR 1.207 SNIP 0.94
Scopus rating (2009): SJR 1.234 SNIP 0.972
Scopus rating (2008): SJR 1.296 SNIP 0.937
Scopus rating (2007): SJR 1.43 SNIP 1.001
Scopus rating (2006): SJR 1.483 SNIP 1.107
Scopus rating (2005): SJR 1.503 SNIP 1.086
Scopus rating (2004): SJR 1.512 SNIP 1.129
Scopus rating (2003): SJR 1.556 SNIP 1.156
Scopus rating (2002): SJR 1.694 SNIP 1.095
Scopus rating (2001): SJR 1.706 SNIP 1.102
Scopus rating (2000): SJR 1.774 SNIP 1.07
Scopus rating (1999): SJR 1.4 SNIP 1
Original language: English
DOIs:
10.1016/j.cplett.2012.02.026

Bibliographical note
Contribution: organisation=keb kem,FACT1=1<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 3834
Research output: Scientific - peer-review › Article

Effect on Charge Transfer and Charge Recombination by Insertion of a Naphthalene-Based Bridge in Molecular Dyads Based on Borondipyrromethene (Bodipy)
Effects of Carbon-Metal-Carbon Linkages on the Optical, Photophysical, and Electrochemical Properties of Phosphametallacycle-Linked Coplanar Porphyrin Dimers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Pages: 1825-1839
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: JOURNAL OF THE AMERICAN CHEMICAL SOCIETY
Volume: 134
Excited State Intramolecular Proton Transfer in Electron-Rich and Electron-Poor Derivatives of 10-Hydroxybenzo[h]quinoline

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Piechowska, J., Huttunen, K., Wrobel, Z., Lemmetyinen, H., Tkachenko, N. V., Gryko, D.
Pages: 9614-9620
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry A
Volume: 116
Issue number: 39
ISSN (Print): 1089-5639
Ratings:
Scopus rating (2016): SJR 1.258 SNIP 0.98 CiteScore 2.64
Scopus rating (2015): SJR 1.179 SNIP 1.106 CiteScore 2.78
Scopus rating (2014): SJR 1.154 SNIP 1.071 CiteScore 2.65
Scopus rating (2013): SJR 1.194 SNIP 1.102 CiteScore 2.84
Scopus rating (2012): SJR 1.494 SNIP 1.124 CiteScore 2.78
Scopus rating (2011): SJR 1.402 SNIP 1.135 CiteScore 2.87
Scopus rating (2010): SJR 1.466 SNIP 1.102
Scopus rating (2009): SJR 1.562 SNIP 1.132
Scopus rating (2008): SJR 1.787 SNIP 1.093
Exploring Förster electronic energy transfer in a decoupled anthracenyl-based borondipyrromethene (bodipy) dyad

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Bai, D., Benniston, A., Hagon, J., Lemmetyinen, H., Tkachenko, N. V., Clegg, W., Harrington, R.
Pages: 4447-4456
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Physical Chemistry Chemical Physics
Volume: 14
Issue number: 13
ISSN (Print): 1463-9076
Ratings:
Scopus rating (2016): CiteScore 4.06 SJR 1.678 SNIP 1.117
Scopus rating (2015): SJR 1.771 SNIP 1.244 CiteScore 4.45
Scopus rating (2014): SJR 1.772 SNIP 1.253 CiteScore 4.29
Scopus rating (2013): SJR 1.715 SNIP 1.216 CiteScore 4.05
Scopus rating (2012): SJR 1.916 SNIP 1.184 CiteScore 3.67
Scopus rating (2011): SJR 1.697 SNIP 1.203 CiteScore 3.6
Scopus rating (2010): SJR 1.802 SNIP 1.196
Scopus rating (2009): SJR 2.127 SNIP 1.369
Scopus rating (2008): SJR 2.158 SNIP 1.211
Scopus rating (2007): SJR 1.84 SNIP 1.138
Scopus rating (2006): SJR 1.467 SNIP 1.128
Scopus rating (2005): SJR 1.389 SNIP 1.104
Scopus rating (2004): SJR 1.173 SNIP 1.007
Scopus rating (2003): SJR 1.093 SNIP 0.925
Scopus rating (2002): SJR 1.122 SNIP 0.973
Scopus rating (2001): SJR 1.09 SNIP 0.914
Scopus rating (2000): SJR 0.948 SNIP 1.068
Scopus rating (1999): SJR 0.121 SNIP 0
Original language: English
DOIs:
10.1039/c2cp23868c
Hydrogen-Bonding Effects on the Formation and Lifetimes of Charge-Separated States in Molecular Triads

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Hankache, J., Niemi, M., Lemmetyinen, H., Wenger, O. S.
Pages: 8159-8168
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry A
Volume: 116
Issue number: 31
ISSN (Print): 1089-5639
Ratings:
Scopus rating (2016): SJR 1.258 SNIP 0.98 CiteScore 2.64
Scopus rating (2015): SJR 1.179 SNIP 1.106 CiteScore 2.78
Scopus rating (2014): SJR 1.154 SNIP 1.071 CiteScore 2.65
Scopus rating (2013): SJR 1.194 SNIP 1.102 CiteScore 2.84
Scopus rating (2012): SJR 1.494 SNIP 1.124 CiteScore 2.78
Scopus rating (2011): SJR 1.402 SNIP 1.135 CiteScore 2.87
Scopus rating (2010): SJR 1.466 SNIP 1.102
Scopus rating (2009): SJR 1.562 SNIP 1.132
Scopus rating (2008): SJR 1.787 SNIP 1.093
Scopus rating (2007): SJR 1.907 SNIP 1.136
Scopus rating (2006): SJR 1.728 SNIP 1.195
Scopus rating (2005): SJR 1.789 SNIP 1.215
Scopus rating (2004): SJR 1.669 SNIP 1.224
Scopus rating (2003): SJR 1.75 SNIP 1.241
Scopus rating (2002): SJR 1.81 SNIP 1.196
Scopus rating (2001): SJR 1.732 SNIP 1.224
Scopus rating (2000): SJR 1.953 SNIP 1.272
Scopus rating (1999): SJR 1.507 SNIP 1.592
Original language: English
DOIs:
10.1021/jp302790j

Bibliographical note
Contribution: organisation=keb kem,FACT1=1<br/>Publisher name: American Chemical Society, ACS
Source: researchoutputwizard
Source-ID: 4142
Research output: Scientific - peer-review › Article

Intramolecular C-H insertion catalyzed by dirhodium(II) complexes using CO2 as the reaction media
In this work, the intramolecular C-H insertion of diazoacetamides catalyzed by dirhodium(II) complexes and using CO2 as solvent is disclosed. The expected lactams were obtained in yields over 97%. The asymmetric intramolecular C-H insertion was also achieved and the beta-lactam 14 was obtained in > 97% yield and 65% ee using the chiral dirhodium(II) catalyst Rh-2(S-PTTL)(4). Finally, the dirhodium(II) complex Rh-2(OAc)(4) was used in two consecutive cycles in which complete conversion to the lactam was observed.
Large Stokes Shift Fluorescent Dyes Based on a Highly Substituted Terephthalic Acid Core

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Benniston, A. C., Winstanley, T. P., Lemmetyinen, H., Tkachenko, N. V., Harrington, R. W., Wills, C.
Pages: 1374-1377
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Organic Letters
Volume: 14
Issue number: 6
ISSN (Print): 1523-7060
Ratings:
Scopus rating (2016): SJR 2.964 SNIP 1.218 CiteScore 6.32
Scopus rating (2015): SJR 3.055 SNIP 1.336 CiteScore 6.38
Scopus rating (2014): SJR 2.958 SNIP 1.324 CiteScore 6.18
Scopus rating (2013): SJR 3.144 SNIP 1.329 CiteScore 6.12
Scopus rating (2012): SJR 3.312 SNIP 1.355 CiteScore 5.7
Scopus rating (2011): SJR 3.271 SNIP 1.377 CiteScore 5.81
Scopus rating (2010): SJR 2.985 SNIP 1.307

Original language: English
Keywords: diazoacetamides, C-H insertion, dirhodium(II), lactams, scCO(2), ASYMMETRIC CYCLOPROPANATION, ALPHA-DIAZOACETAMIDES, HOMOGENEOUS CATALYSIS, SUPERCRITICAL FLUIDS, CARBOXYLATES, ENANTIOSELECTIVITY, TRANSFORMATIONS, IMMOBILIZATION, ACTIVATION, STRATEGY
DOIs:
10.1021/ol300523m
Source: WOS
Source-ID: 000310597800014
Research output: Scientific - peer-review › Article
Making expensive dirhodium(II) catalysts cheaper: Rh(II) recycling methods
Dirhodium(II) catalysts have been widely used as a remarkable tool in organic synthesis, ultimately resulting in a myriad of transformations and formation of a wide variety of compounds, every so often intermediaries in drug synthesis. Aiming at a more sustainable chemistry, several methods suitable for the reutilisation of expensive dirhodium complexes have been developed. Herein, we provide a combined overview of the available methods for recovering and reusing dirhodium(II) metal complexes in catalysis, covering homogeneous catalysis as well as heterogenisation methods.
Meteorological parameters as an important factor on the energy recovery of landfill gas in landfills

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Uyanik, I., Özkaya, B., Demir, S., Cakmakci, M.
Publication date: 2012
Peer-reviewed: Yes

**Publication Information**
Journal: Journal of Renewable and Sustainable Energy
Volume: 4
Issue number: 6
Article number: 063135
ISSN (Print): 1941-7012
Ratings:
Scopus rating (2016): SJR 0.418 SNIP 0.523 CiteScore 1.2
Scopus rating (2015): SJR 0.372 SNIP 0.52 CiteScore 1.02
Scopus rating (2014): SJR 0.406 SNIP 0.697 CiteScore 1.05
Scopus rating (2013): SJR 0.441 SNIP 0.856 CiteScore 1.26
Scopus rating (2012): SJR 0.575 SNIP 1.246 CiteScore 1.77
Scopus rating (2011): SJR 0.344 SNIP 1.024 CiteScore 1.3
Original language: English
DOIs:
10.1063/1.4769202

**Bibliographical note**
Contribution: organisation=keb,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: American Institute of Physics AIP
Source: researchoutputwizard
Source-ID: 5478
Research output: Scientific - peer-review › Article

Modulation of visible room temperature phosphorescence by weak magnetic fields

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Mani, T., Tanabe, M., Yamauchi, S., Tkachenko, N. V., Vinogradov, S. A.
Pages: 3115-3119
Publication date: 2012
Peer-reviewed: Yes

**Publication Information**
Journal: Journal of Physical Chemistry Letters
Volume: 3
Issue number: 21
ISSN (Print): 1948-7185
Ratings:
Scopus rating (2016): CiteScore 8.18 SJR 4.583 SNIP 1.68
Scopus rating (2015): SJR 4.233 SNIP 1.829 CiteScore 8.04
Scopus rating (2014): SJR 3.722 SNIP 1.724 CiteScore 7
Photochemical properties and sensor applications of modified yellow fluorescent protein (YFP) covalently attached to the surfaces of etched optical fibers (EOFs)

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics, Urban circular bioeconomy (UrCiBio)
Authors: Veselov, A. A., George Abraham, B., Lemmetyinen, H., Karp, M. T., Tkachenko, N. V.
Pages: 1149-1158
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Analytical and Bioanalytical Chemistry
Volume: 402
Issue number: 3
ISSN (Print): 1618-2642
Ratings:
- Scopus rating (2016): CiteScore 3.03 SJR 0.943 SNIP 1.039
- Scopus rating (2015): SJR 1.064 SNIP 1.083 CiteScore 3.07
- Scopus rating (2014): SJR 1.126 SNIP 1.222 CiteScore 3.26
- Scopus rating (2013): SJR 1.229 SNIP 1.282 CiteScore 3.55
- Scopus rating (2012): SJR 1.347 SNIP 1.282 CiteScore 3.51
- Scopus rating (2011): SJR 1.363 SNIP 1.275 CiteScore 3.47
- Scopus rating (2010): SJR 1.354 SNIP 1.236
- Scopus rating (2009): SJR 1.272 SNIP 1.237
- Scopus rating (2008): SJR 1.144 SNIP 1.076
- Scopus rating (2007): SJR 1.08 SNIP 1.096
- Scopus rating (2006): SJR 0.981 SNIP 1.051
- Scopus rating (2005): SJR 0.963 SNIP 1.134
- Scopus rating (2004): SJR 0.88 SNIP 0.968
- Scopus rating (2003): SJR 0.782 SNIP 1.155
- Scopus rating (2002): SJR 0.699 SNIP 0.818
- Scopus rating (1999): SJR 0.715 SNIP 1.007
Original language: English
DOIs:
10.1007/s00216-011-5564-4

Photoinduced charge shift and charge recombination through an alkynyl spacer for an expanded acridinium-based dyad

General information
Photolysis and Quantum-Chemical Calculations of the Nalidixic Acid Radical States

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Department of Physics, Computational Science X (CompX)
Authors: Polischuk, A., Emelina, T., Cramariuc, O., Chukharev, V., Karaseva, T., Karasev, V.
Pages: 323-328
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Russian Journal of General Chemistry
Volume: 82
Issue number: 2
ISSN (Print): 1070-3632
Ratings:
Scopus rating (2016): SJR 0.202 SNIP 0.5 CiteScore 0.46
Scopus rating (2015): SJR 0.212 SNIP 0.541 CiteScore 0.42
Scopus rating (2014): SJR 0.23 SNIP 0.585 CiteScore 0.4
Scopus rating (2013): SJR 0.217 SNIP 0.39 CiteScore 0.3
Scopus rating (2012): SJR 0.201 SNIP 0.29 CiteScore 0.24
Scopus rating (2011): SJR 0.198 SNIP 0.265 CiteScore 0.26
Scopus rating (2010): SJR 0.176 SNIP 0.233
Scopus rating (2009): SJR 0.168 SNIP 0.268
Scopus rating (2008): SJR 0.18 SNIP 0.299
Scopus rating (2007): SJR 0.184 SNIP 0.257
Scopus rating (2006): SJR 0.236 SNIP 0.479
Scopus rating (2005): SJR 0.144 SNIP 0.192
Scopus rating (2004): SJR 0.141 SNIP 0.191
Photophysics of Fe(III)-tartrate and Fe(III)-citrate complexes in aqueous solutions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Pages: 45-48
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Chemical Physics Letters
Volume: 530
ISSN (Print): 0009-2614
Ratings:
Scopus rating (2016): SJR 0.726 SNIP 0.721 CiteScore 1.71
Scopus rating (2015): SJR 0.733 SNIP 0.747 CiteScore 1.83
Scopus rating (2014): SJR 0.757 SNIP 0.773 CiteScore 1.83
Scopus rating (2013): SJR 0.856 SNIP 0.844 CiteScore 2.07
Scopus rating (2012): SJR 1.101 SNIP 0.916 CiteScore 2.2
Scopus rating (2011): SJR 1.156 SNIP 1.013 CiteScore 2.38
Scopus rating (2010): SJR 1.207 SNIP 0.94
Scopus rating (2009): SJR 1.234 SNIP 0.972
Scopus rating (2008): SJR 1.296 SNIP 0.937
Scopus rating (2007): SJR 1.43 SNIP 1.001
Scopus rating (2006): SJR 1.483 SNIP 1.107
Scopus rating (2005): SJR 1.503 SNIP 1.086
Scopus rating (2004): SJR 1.512 SNIP 1.129
Scopus rating (2003): SJR 1.556 SNIP 1.156
Scopus rating (2002): SJR 1.694 SNIP 1.095
Scopus rating (2001): SJR 1.706 SNIP 1.102
Scopus rating (2000): SJR 1.774 SNIP 1.07
Scopus rating (1999): SJR 1.4 SNIP 1

Original language: English
DOI:
10.1016/j.cplett.2012.01.051

Bibliographical note
Contribution: organisation=fsys,FACT1=0.5
Contribution: organisation=keb kem,FACT2=0.5
Publisher name: MAIK Nauka - Interperiodica : Pleiades Publishing
Source: researchoutputwizard
Source-ID: 5080
Research output: Scientific - peer-review > Article
Preparation and Photophysical and Photoelectrochemical Properties of a Covalently Fixed Porphyrin–Chemically Converted Graphene Composite

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Pages: 4250-4257
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Chemistry: A European Journal
Volume: 18
Issue number: 14
ISSN (Print): 0947-6539
Ratings:
Scopus rating (2016): CiteScore 5.03 SJR 2.247 SNIP 1.046
Scopus rating (2015): SJR 2.416 SNIP 1.184 CiteScore 4.99
Scopus rating (2014): SJR 2.487 SNIP 1.219 CiteScore 5.51
Scopus rating (2013): SJR 2.604 SNIP 1.239 CiteScore 5.68
Scopus rating (2012): SJR 2.884 SNIP 1.294 CiteScore 5.55
Scopus rating (2011): SJR 2.726 SNIP 1.336 CiteScore 5.46
Scopus rating (2010): SJR 2.527 SNIP 1.292
Scopus rating (2009): SJR 2.499 SNIP 1.365
Scopus rating (2008): SJR 2.887 SNIP 1.407
Scopus rating (2007): SJR 3.233 SNIP 1.532
Scopus rating (2006): SJR 2.911 SNIP 1.505
Scopus rating (2005): SJR 2.62 SNIP 1.454
Scopus rating (2004): SJR 2.32 SNIP 1.472
Scopus rating (2003): SJR 2.156 SNIP 1.45
Scopus rating (2002): SJR 2.554 SNIP 1.472
Scopus rating (2001): SJR 2.834 SNIP 1.612
Scopus rating (2000): SJR 2.956 SNIP 1.652
Scopus rating (1999): SJR 3.013 SNIP 1.73
Original language: English
DOIs: 10.1002/chem.201103843

Bibliographical note
Contribution: organisation=keb kem,FACT1=1<br/>Publisher name: Wiley - V C H Verlag GmbH & Co. KGaA
Source: researchoutputwizard
Source-ID: 5470
Research output: Scientific - peer-review » Article

Processing and sustained in vitro release of rifampicin containing composites to enhance the treatment of osteomyelitis
The objective in this study was to develop an osteoconductive, biodegradable and rifampicin releasing bone filling composite material for the treatment of osteomyelitis, a bacterial infection of bone that is very difficult and expensive to treat. The composite material will be used together with a ciprofloxacin releasing composite, because of the rapid development of resistant bacteria when rifampicin is used alone. Three composites were manufactured by twin-screw extrusion. The polymer matrix for the composites was poly(L-lactide-co-ε-caprolactone) 70/30 and all the composites contained 8 wt% (weight percent) of rifampicin antibiotic. The b-TCP contents of the composites were 0 wt%, 50 wt% and 60 wt%. The composites were sterilized by gamma irradiation before in vitro degradation and drug release tests. The hydrolytical degradation of the studied composites proceeded quickly and the molecular weight of the polymer component of the composites decreased rapidly. Rifampicin release occurred in four phases in which the high b-TCP content of the samples, polymer degradation and mass loss all played a role in determining the phases. The ceramic component was
seen to have a positive effect on the drug release. The composite with 50 wt% of b-TCP showed the most promising rifampicin release profile and it also showed activity against a common osteomyelitis causing bacteria Pseudomonas aeruginosa. A clear inhibition zone was formed in 16 h incubation. Overall, the tested materials showed great potential to be developed into a bone filler material for the treatment of osteomyelitis or other bone related infections in combination with the ciprofloxacin releasing materials.

**Quantitative Analysis of Intramolecular Exciplex and Electron Transfer in a Double-Linked Zinc Porphyrin-Fullerene Dyad**

seen to have a positive effect on the drug release. The composite with 50 wt% of b-TCP showed the most promising rifampicin release profile and it also showed activity against a common osteomyelitis causing bacteria Pseudomonas aeruginosa. A clear inhibition zone was formed in 16 h incubation. Overall, the tested materials showed great potential to be developed into a bone filler material for the treatment of osteomyelitis or other bone related infections in combination with the ciprofloxacin releasing materials.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Biomedical Engineering, Department of Chemistry and Bioengineering, Frontier Photonics, Integrated Technologies for Tissue Engineering Research (ITTE), Urban circular bioeconomy (UrCirBio)
Authors: Ahola, N., Veiranto, M., Männistö, N., Karp, M., Rich, J., Efimov, A., Seppälä, J., Kellomäki, M.
Number of pages: 13
Pages: 1-13
Publication date: 2012
Peer-reviewed: Yes

**Publication information**
Journal: Biomatter
Volume: 2
Issue number: 4
ISSN (Print): 2159-2527
Ratings:
Scopus rating (2016): SJR 0.579 SNIP 3.262 CiteScore 1.92
Scopus rating (2015): SJR 0.627 SNIP 1.402 CiteScore 2.67
Scopus rating (2014): SJR 0.632 SNIP 0.47 CiteScore 2.39
Scopus rating (2013): SJR 0.329 CiteScore 1.2
Scopus rating (2012): SJR 0.143
Original language: English
Electronic versions:
ahola_processing_and_sustained_in_vitro_release.pdf
DOIs:
10.4161/biom.22793
Links:
http://www.landesbioscience.com/journals/biomatter/
http://urn.fi/URN:NBN:fi:tty-201401301068

**Bibliographical note**
ei ut-numeroa 9.8.2013<br/>Contribution: organisation=bme,FACT1=0.8<br/>Contribution: organisation=keb bio,FACT2=0.1<br/>Publisher name: Landes Bioscience
Source: researchoutputwizard
Source-ID: 3813
Research output: Scientific - peer-review › Article

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Al-Subi, A., Niemi, M., Tkachenko, N., Lemmetyinen, H.
Pages: 9653-9661
Publication date: 2012
Peer-reviewed: Yes

**Publication information**
Journal: Journal of Physical Chemistry A
Volume: 116
Issue number: 39
ISSN (Print): 1089-5639
Ratings:
Scopus rating (2016): SJR 1.258 SNIP 0.98 CiteScore 2.64
Redox processes in photochemistry of Pt(IV) hexahaloid complexes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Glebov, E., Kolomeets, A., Pozdnyakov, I., Plyusnin, V., Grivin, V., Tkachenko, N., Lemmetyinen, H.
Pages: 5768-5778
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: RSC Advances
Volume: 2
Issue number: 13
ISSN (Print): 2046-2069
Ratings:
Scopus rating (2016): CiteScore 3.06 SJR 0.875 SNIP 0.743
Scopus rating (2015): SJR 0.959 SNIP 0.837 CiteScore 3.42
Scopus rating (2014): SJR 1.114 SNIP 0.965 CiteScore 3.87
Scopus rating (2013): SJR 1.117 SNIP 0.903 CiteScore 3.74
Scopus rating (2012): SJR 0.863 SNIP 0.603 CiteScore 2.4
Original language: English
DOIs: 10.1039/c2ra20715j

Bibliographical note
Contribution: organisation=keb kem,FACT1=1<br/>Publisher name: RSC Publications
Source: researchoutputwizard
Source-ID: 4091
Research output: Scientific - peer-review › Article
Syntheses and Excitation Transfer Studies of Near-Orthogonal Free-Base Porphyrin – Ruthenium Phthalocyanine Dyads and Pentad

General information
State: Published
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Jacobs, R., Stranius, K., Maligaspe, E., Lemmetyinen, H., Tkachenko, N. V., Zandler, M. E., D’Souza, F.
Pages: 3656-3665
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Inorganic Chemistry
Volume: 51
Issue number: 6
ISSN (Print): 0020-1669
Scopus rating (2016): SJR 1.774 SNIP 1.198 CiteScore 4.64
Scopus rating (2015): SJR 1.805 SNIP 1.239 CiteScore 4.7
Scopus rating (2014): SJR 1.869 SNIP 1.314 CiteScore 4.69
Scopus rating (2013): SJR 1.819 SNIP 1.379 CiteScore 4.9
Scopus rating (2012): SJR 2.08 SNIP 1.35 CiteScore 4.72
Scopus rating (2011): SJR 1.952 SNIP 1.373 CiteScore 4.64
Scopus rating (2010): SJR 1.98 SNIP 1.323
Scopus rating (2009): SJR 1.982 SNIP 1.47
Scopus rating (2008): SJR 2.025 SNIP 1.412
Scopus rating (2007): SJR 2.136 SNIP 1.544
Scopus rating (2006): SJR 1.828 SNIP 1.508
Scopus rating (2005): SJR 2.012 SNIP 1.46
Scopus rating (2004): SJR 1.672 SNIP 1.382
Scopus rating (2003): SJR 1.498 SNIP 1.465
Synthesis and characterization of tris-(5-amino-8-hydroxyquinoline)aluminum complexes and their use as anode buffer layers in inverted organic solar cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Pages: 22971-22982
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Chemistry
Volume: 22
Issue number: 43
ISSN (Print): 0959-9428
Ratings:
Scopus rating (2015): SJR 2.452 SNIP 2.236
Scopus rating (2014): SJR 2.457 SNIP 2.296
Scopus rating (2013): SJR 2.249 SNIP 1.84
Scopus rating (2012): SJR 2.771 SNIP 1.523
Scopus rating (2011): SJR 2.616 SNIP 1.565
Scopus rating (2010): SJR 2.602 SNIP 1.484
Scopus rating (2009): SJR 2.526 SNIP 1.529
Scopus rating (2008): SJR 2.587 SNIP 1.658
Scopus rating (2007): SJR 2.623 SNIP 1.591
Scopus rating (2006): SJR 2.375 SNIP 1.551
Scopus rating (2005): SJR 1.983 SNIP 1.501
Scopus rating (2004): SJR 1.525 SNIP 1.356
Scopus rating (2003): SJR 1.509 SNIP 1.39
Scopus rating (2002): SJR 1.617 SNIP 1.505
Scopus rating (2001): SJR 1.479 SNIP 1.552
Scopus rating (2000): SJR 1.386 SNIP 1.35
Scopus rating (1999): SJR 1.263 SNIP 1.423
Original language: English
DOIs:
10.1039/C2JM35292C

Bibliographical note
Contribution: organisation=keb kem,FACT1=1<br/>Publisher name: Royal Society of Chemistry, RSC
Source: researchoutputwizard
Source-ID: 4807
Research output: Scientific - peer-review › Article
Synthesis of 2-Aryl-Substituted Chromans by Intramolecular C-O Bond Formation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Wang, Y., Franzen, R.
Pages: 925-929
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Synlett
Issue number: 6
ISSN (Print): 0936-5214
Ratings:
Scopus rating (2016): SJR 0.856 SNIP 0.461 CiteScore 1.84
Scopus rating (2015): SJR 0.875 SNIP 0.494 CiteScore 2
Scopus rating (2014): SJR 0.956 SNIP 0.574 CiteScore 2.09
Scopus rating (2013): SJR 1.017 SNIP 0.567 CiteScore 2.08
Scopus rating (2012): SJR 1.137 SNIP 0.623 CiteScore 2.1
Scopus rating (2011): SJR 1.288 SNIP 0.664 CiteScore 2.43
Scopus rating (2010): SJR 1.214 SNIP 0.63
Scopus rating (2009): SJR 1.261 SNIP 0.685
Scopus rating (2008): SJR 1.465 SNIP 0.728
Scopus rating (2007): SJR 1.525 SNIP 0.807
Scopus rating (2006): SJR 1.486 SNIP 0.827
Scopus rating (2005): SJR 1.266 SNIP 0.779
Scopus rating (2004): SJR 1.374 SNIP 0.836
Scopus rating (2003): SJR 1.304 SNIP 0.916
Scopus rating (2002): SJR 1.669 SNIP 0.921
Scopus rating (2001): SJR 1.456 SNIP 0.901
Scopus rating (2000): SJR 1.581 SNIP 0.877
Scopus rating (1999): SJR 1.403 SNIP 0.887
Original language: English
DOIs:
10.1055/s-0031-1290607

Bibliographical note
Contribution: organisation=keb kem,FACT1=1<br/>Publisher name: Georg Thieme Verlag
Source: researchoutputwizard
Source-ID: 5585
Research output: Scientific - peer-review › Article

Synthesis of porphyrinoids with silane anchors and their covalent self-assembling and metallation on solid surface

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Sariola-Leikas, E., Hietala, M., Veselov, A., Okhotnikov, O., Semjonov, S. L., Tkachenko, N. V., Lemmetyinen, H. , Efimov, A.
Pages: 58-70
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Colloid and Interface Science
Synthesis of titanate nanostructures using amorphous precursor material and their adsorption/photocatalytic properties

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Ylhäinen, E. K., Nunes, M., Silvestre, A., Monteiro, O.
Pages: 4305-4312
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Science
Volume: 47
Issue number: 10
ISSN (Print): 0022-2461
Ratings:
Scopus rating (2016): CiteScore 2.49 SJR 0.762 SNIP 1.064
Scopus rating (2015): SJR 0.811 SNIP 1.081 CiteScore 2.36
Scopus rating (2014): SJR 0.985 SNIP 1.431 CiteScore 2.54
Scopus rating (2013): SJR 0.933 SNIP 1.472 CiteScore 2.36
Scopus rating (2012): SJR 0.991 SNIP 1.407 CiteScore 2.2
Scopus rating (2011): SJR 0.941 SNIP 1.393 CiteScore 2.05
Scopus rating (2010): SJR 0.965 SNIP 1.097
Scopus rating (2009): SJR 0.842 SNIP 0.963
Scopus rating (2008): SJR 0.68 SNIP 0.772
The fluorine effect: photophysical properties of borondipyrromethene (bodipy) dyes appended at the meso position with fluorinated aryl groups

General information
State: Published
Ministry of Education publication type: A1 Journal article refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Alamiry, M. A., Benniston, A. C., Hagon, J., Winstanley, T. P., Lemmetyinen, H., Tkachenko, N. V.
Pages: 4944-4950
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: RSC Advances
Volume: 2
Issue number: 11
ISSN (Print): 2046-2069
Ratings:
Scopus rating (2016): CiteScore 3.06 SJR 0.875 SNIP 0.743
Scopus rating (2015): SJR 0.959 SNIP 0.837 CiteScore 3.42
Scopus rating (2014): SJR 1.114 SNIP 0.965 CiteScore 3.87
Scopus rating (2013): SJR 1.117 SNIP 0.903 CiteScore 3.74
Scopus rating (2012): SJR 0.863 SNIP 0.603 CiteScore 2.4
Original language: English
DOIs:
10.1039/c2ra20219k

Vectorial Photoinduced Charge Transfer in Langmuir-Blodgett Films of Porphyrin-Based Donor-Acceptor Systems

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Tkachenko, N., Lemmetyinen, H.
Construction of bispirooxindoles containing three quaternary stereocentres in a cascade using a single multifunctional organocatalyst

Single-step constructions of molecules with multiple quaternary carbon stereocentres are rare. The spirooxindole structural motif is common to a range of bioactive compounds; however, asymmetric synthesis of this motif is complicated due to the presence of multiple chiral centres. The development of organocatalytic cascade reactions has proven to be valuable for the construction of several chiral centres in one step. Here, we describe a newly designed organocatalytic asymmetric domino Michael-aldol reaction between 3-substituted oxindoles and methyleneindolinones that affords complex bispirooxindoles. This reaction was catalysed by a novel multifunctional organocatalyst that contains tertiary and primary amines and thiourea moieties to activate substrates simultaneously, providing extraordinary levels of stereocontrol over four stereocentres, three of which are quaternary carbon stereocentres. This new methodology provides facile access to a range of multisubstituted bispirocyclooxindole derivatives, and should be useful in medicinal chemistry and diversity-oriented syntheses of this intriguing class of compounds.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Tan, B., Candeias, N. R., Barbas, C. F.
Number of pages: 5
Pages: 473-477
Publication date: Jun 2011
Peer-reviewed: Yes

Publication information
Journal: Nature Chemistry
Volume: 3
Issue number: 6
ISSN (Print): 1755-4330

Scopus rating (2016): SJR 12.268 SNIP 4.877 CiteScore 14.61
Scopus rating (2015): SJR 11.125 SNIP 4.69 CiteScore 15.17
Scopus rating (2014): SJR 10.495 SNIP 4.493 CiteScore 13.67
Scopus rating (2013): SJR 8.621 SNIP 3.689 CiteScore 12.35
Scopus rating (2012): SJR 9.039 SNIP 3.588 CiteScore 11.09
Scopus rating (2011): SJR 7.515 SNIP 3.513 CiteScore 9.74
Scopus rating (2010): SJR 6.302 SNIP 2.702

Original language: English
Keywords: ENANTIOSELECTIVE CONJUGATE ADDITION, C BOND FORMATION, NATURAL-PRODUCTS, STEREOCONTROLLED CREATION, CINCHONA ALKALOIDS, DOMINO REACTIONS, ALDER REACTIONS, OXINDOLES, THIOUREA, DERIVATIVES
Core-Structure-Motivated Design of a Phosphine-Catalyzed [3+2] Cycloaddition Reaction: Enantioselective Syntheses of Spirocyclopenteneoxindoles

A novel organocatalytic asymmetric [3 + 2] cycloaddition reaction between methyleneindolinones and allylic compounds yielding complex spirocyclopenteneoxindoles has been developed. It provides extraordinary levels of enantioselective control involving a chiral phosphine as a nucleophilic organocatalyst. Simple precursors were used under mild conditions to construct oxindole derivatives with high enantiopurity and structural diversity. This method should be useful in medicinal chemistry and diversity-oriented syntheses of these intriguing compounds.
1,7- And 1,6-Regioisomers of Diphenoxy and Dipyrrolidinyl Substituted Perylene Diimides: Synthesis, Separation, Characterization, and Comparison of Electrochemical and Optical Properties

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Dubey, R. K., Efimov, A., Lemmetyinen, H.
Pages: 778-788
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Chemistry of Materials
Volume: 23
Issue number: 3
ISSN (Print): 0897-4756
Ratings:
Scopus rating (2016): SJR 4.114 SNIP 1.905 CiteScore 8.89
Scopus rating (2015): SJR 4.038 SNIP 2.102 CiteScore 9.38
Scopus rating (2014): SJR 3.603 SNIP 2.253 CiteScore 8.89
Scopus rating (2013): SJR 3.658 SNIP 2.277 CiteScore 8.94
Scopus rating (2012): SJR 4.169 SNIP 2.264 CiteScore 8.1
Scopus rating (2011): SJR 3.484 SNIP 2.145 CiteScore 7.38
Scopus rating (2010): SJR 3.267 SNIP 1.849
Scopus rating (2009): SJR 2.894 SNIP 1.763
Scopus rating (2008): SJR 2.882 SNIP 1.844
Scopus rating (2007): SJR 3.111 SNIP 1.863
Scopus rating (2006): SJR 3.168 SNIP 1.943
Scopus rating (2005): SJR 2.746 SNIP 1.937
Scopus rating (2004): SJR 2.5 SNIP 1.976
Scopus rating (2003): SJR 2.56 SNIP 1.938
Scopus rating (2002): SJR 2.499 SNIP 1.894
Scopus rating (2001): SJR 2.321 SNIP 1.911
Scopus rating (2000): SJR 2.201 SNIP 1.686
Scopus rating (1999): SJR 2.23 SNIP 1.796
Original language: English
DOIs:
10.1021/cm1018647

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Source: researchoutputwizard
Source-ID: 5891
Research output: Scientific - peer-review › Article

Anaerobic H-2 production at elevated temperature (60 °c) by enriched mixed consortia from mesophilic sources

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Karadag, D.
Pages: 458-465
Publication date: 2011
Peer-reviewed: Yes

Publication information
Volume: 36
A solid phase extraction technique for HPLC analysis of short chain fatty acid fluxes during microbial degradation of plant polymers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Carver, S., Munster, U., Tuovinen, O. H.
Pages: 1546-1555
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Liquid Chromatography and Related Technologies
Volume: 34
Issue number: 15
ISSN (Print): 1082-6076
Ratings:
Scopus rating (2016): SJR 0.282 SNIP 0.392 CiteScore 0.69
Scopus rating (2015): SJR 0.291 SNIP 0.463 CiteScore 0.69
Scopus rating (2014): SJR 0.297 SNIP 0.527 CiteScore 0.75
Scopus rating (2013): SJR 0.286 SNIP 0.471 CiteScore 0.75
Scopus rating (2012): SJR 0.311 SNIP 0.425 CiteScore 0.68
Scopus rating (2011): SJR 0.454 SNIP 0.461 CiteScore 0.8
Scopus rating (2010): SJR 0.5 SNIP 0.553
Scopus rating (2009): SJR 0.546 SNIP 0.579
Scopus rating (2008): SJR 0.483 SNIP 0.583
Biohydrogen production in alkalithermophilic conditions: Thermobrachium celere as a case study

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Urban circular bioeconomy (UrCirBio)
Authors: Ciranna, A., Santala, V., Karp, M.
Pages: 8714-8722
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Bioresource Technology
Volume: 102
Issue number: 18
ISSN (Print): 0960-8524
Ratings:
Scopus rating (2016): CiteScore 5.94 SJR 2.191 SNIP 1.91
Scopus rating (2015): SJR 2.255 SNIP 1.908 CiteScore 5.47
Scopus rating (2014): SJR 2.41 SNIP 2.104 CiteScore 5.3
Scopus rating (2013): SJR 2.412 SNIP 2.503 CiteScore 5.97
Scopus rating (2012): SJR 2.389 SNIP 2.465 CiteScore 5.25
Scopus rating (2011): SJR 2.314 SNIP 2.508 CiteScore 5.56
Scopus rating (2010): SJR 2.086 SNIP 2.355
Scopus rating (2009): SJR 1.912 SNIP 2.231
Scopus rating (2008): SJR 1.734 SNIP 2.732
Scopus rating (2007): SJR 1.529 SNIP 2.423
Scopus rating (2006): SJR 1.315 SNIP 1.98
Scopus rating (2005): SJR 1.269 SNIP 2.006
Scopus rating (2004): SJR 1.197 SNIP 1.659
Scopus rating (2003): SJR 0.948 SNIP 1.639
Scopus rating (2002): SJR 0.882 SNIP 1.3
Scopus rating (2001): SJR 0.541 SNIP 1.208
Scopus rating (2000): SJR 0.464 SNIP 1.049
Scopus rating (1999): SJR 0.669 SNIP 1.061
Original language: English
DOIs:
10.1016/j.biortech.2011.01.028

Carbon Nanotube Wiring of Donor-Acceptor Nanograins by Self-Assembly and Efficient Charge Transport

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Comparison of sea surface microlayer and subsurface water bacterial communities in the Baltic sea

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Lindroos, A., Szabo, H. M., Nikinmaa, M., Leskinen, P.
Pages: 29-42
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Aquatic Microbial Ecology
Volume: 65
Issue number: 1
ISSN (Print): 0948-3055
Ratings:
Scopus rating (2016): SJR 0.805 SNIP 0.567 CiteScore 1.77
Scopus rating (2015): SJR 1.124 SNIP 0.768 CiteScore 2.21
Scopus rating (2014): SJR 0.893 SNIP 0.699 CiteScore 1.88
Scopus rating (2013): SJR 1.021 SNIP 0.844 CiteScore 2.16
Scopus rating (2012): SJR 1.389 SNIP 0.921 CiteScore 2.49
Covalent phthalocyanine-fullerene dyads: synthesis, electron transfer in solutions and molecular films

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Tkachenko, N. V., Efimov, A., Lemmetyinen, H.
Pages: 780-790
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Porphyrins and Phthalocyanines
Volume: 15
Issue number: 9-10
ISSN (Print): 1088-4246
Ratings:
Scopus rating (2016): SJR 0.354 SNIP 0.379 CiteScore 1.05
Scopus rating (2015): SJR 0.419 SNIP 0.467 CiteScore 1.17
Scopus rating (2014): SJR 0.486 SNIP 0.545 CiteScore 1.39
Scopus rating (2013): SJR 0.537 SNIP 0.602 CiteScore 1.39
Scopus rating (2012): SJR 0.62 SNIP 0.537 CiteScore 1.36
Scopus rating (2011): SJR 0.553 SNIP 0.612 CiteScore 1.4
Scopus rating (2010): SJR 0.564 SNIP 0.46
Scopus rating (2009): SJR 0.511 SNIP 0.447
Scopus rating (2008): SJR 0.572 SNIP 0.481
Scopus rating (2007): SJR 0.669 SNIP 0.481
Scopus rating (2006): SJR 0.625 SNIP 0.529
Scopus rating (2005): SJR 0.632 SNIP 0.593
Scopus rating (2004): SJR 0.646 SNIP 0.667
Scopus rating (2003): SJR 0.591 SNIP 0.88
Scopus rating (2002): SJR 0.86 SNIP 1.153
Scopus rating (2001): SJR 0.796 SNIP 1.08
Scopus rating (2000): SJR 0.863 SNIP 0.759
Dynamics of Photoinduced Charge Transfer of Fullerene Based Donor-Acceptor Systems: From Solution to Organized Molecular Films

Effect of Anion Ligation on Electron Transfer of Double-Linked Zinc Porphyrin - Fullerene Dyad
Effects of fullerene encapsulation on structure and photophysical properties of porphyrin-linked single-walled carbon nanotubes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Umeyama, T., Mihara, J., Hayashi, H., Kadota, N., Chukharev, V., Tkachenko, N., Lemmetyinen, H., Yoshida, K., Isoda, S., Imahori, H.
Pages: 11781-11783
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Chemical Communications
Volume: 47
Issue number: 42
ISSN (Print): 1359-7345
Ratings:
Scopus rating (2016): CiteScore 6.06 SJR 2.506 SNIP 1.159
Scopus rating (2015): SJR 2.664 SNIP 1.314 CiteScore 6.7
Scopus rating (2014): SJR 2.701 SNIP 1.446 CiteScore 6.83
Scopus rating (2013): SJR 2.755 SNIP 1.38 CiteScore 6.73
Scopus rating (2012): SJR 3.09 SNIP 1.347 CiteScore 6.21
Scopus rating (2011): SJR 2.857 SNIP 1.322 CiteScore 5.96
Scopus rating (2010): SJR 2.709 SNIP 1.232
Scopus rating (2009): SJR 2.588 SNIP 1.252
Scopus rating (2008): SJR 2.791 SNIP 1.236
Scopus rating (2007): SJR 2.851 SNIP 1.237
Scopus rating (2006): SJR 2.366 SNIP 1.183
Scopus rating (2005): SJR 2.129 SNIP 1.15
Scopus rating (2004): SJR 1.954 SNIP 1.158
Scopus rating (2003): SJR 1.644 SNIP 1.098
Scopus rating (2002): SJR 1.956 SNIP 1.19
Scopus rating (2001): SJR 1.817 SNIP 1.098
Scopus rating (2000): SJR 1.649 SNIP 1.028
Electronic Structure Manipulation of (Benzothiazole)zinc Complexes: Synthesis, Optical and Electrochemical Studies of 5-Substituted Derivatives

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Dey, S., Efimov, A., Giri, C., Rissanen, K., Lemmetyinen, H.
Pages: 6226-6232
Publication date: 2011
Peer-reviewed: Yes

Publication information
Volume: 2011
Issue number: 31
ISSN (Print): 1434-193X
Ratings:
Scopus rating (2016): CiteScore 2.74 SJR 1.133 SNIP 0.653
Scopus rating (2015): SJR 1.198 SNIP 0.758 CiteScore 2.88
Scopus rating (2014): SJR 1.181 SNIP 0.767 CiteScore 2.96
Scopus rating (2013): SJR 1.292 SNIP 0.796 CiteScore 2.96
Scopus rating (2012): SJR 1.471 SNIP 0.811 CiteScore 2.93
Scopus rating (2011): SJR 1.536 SNIP 0.857 CiteScore 3.2
Scopus rating (2010): SJR 1.572 SNIP 0.785
Scopus rating (2009): SJR 1.497 SNIP 0.778
Scopus rating (2008): SJR 1.652 SNIP 0.759
Scopus rating (2007): SJR 1.711 SNIP 0.84
Scopus rating (2006): SJR 1.505 SNIP 0.849
Scopus rating (2005): SJR 1.246 SNIP 0.763
Scopus rating (2004): SJR 1.2 SNIP 0.81
Scopus rating (2003): SJR 1.19 SNIP 0.802
Scopus rating (2002): SJR 1.382 SNIP 0.829
Scopus rating (2001): SJR 1.159 SNIP 0.816
Scopus rating (2000): SJR 1.192 SNIP 1.048
Scopus rating (1999): SJR 0.877 SNIP 0.976
Original language: English
DOIs:
10.1002/ejoc.201100186

Bibliographical note
Contribution: organisation=keb,kem,FACT1=1
Source: researchoutputwizard
Source-ID: 5881
Research output: Scientific - peer-review › Article

Enhanced performance and stability of inverted organic solar cells by using novel zinc-benzothiazole complexes as anode buffer layer
Excitation energy transfer in the LHC-II trimer: from carotenoids to chlorophylls in space and time

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Martiskainen, J., Kananavicius, R., Linnanto, J., Lehtivuori, H., Keraenen, M., Aumanen, V., Tkachenko, N., Korppi-Tommola, J.
Pages: 195-207
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Photosynthesis Research
Volume: 107
Issue number: 2
ISSN (Print): 0166-8595
Ratings:
Fused Alq3 derivatives: syntheses and photophysical characteristics

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Heiskanen, J. P., Tolkki, A. E., Lemmetyinen, H. J., Hormi, O. E. O.
Pages: 14766-14775
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Chemistry
Volume: 21
ISSN (Print): 0959-9428
Ratings:
Scopus rating (2016): SJR 1.617 SNIP 1.247 CiteScore 3.66
Scopus rating (2015): SJR 1.265 SNIP 1.243 CiteScore 3.44
Scopus rating (2014): SJR 1.198 SNIP 1.094 CiteScore 3.02
Scopus rating (2013): SJR 1.29 SNIP 1.258 CiteScore 3.44
Scopus rating (2012): SJR 1.371 SNIP 1.057 CiteScore 2.95
Scopus rating (2011): SJR 1.305 SNIP 1.094 CiteScore 2.86
Scopus rating (2010): SJR 1.05 SNIP 0.919
Scopus rating (2009): SJR 1.056 SNIP 0.872
Scopus rating (2008): SJR 1.067 SNIP 0.863
Scopus rating (2007): SJR 1.244 SNIP 0.774
Scopus rating (2006): SJR 1.142 SNIP 0.739
Scopus rating (2005): SJR 0.934 SNIP 0.737
Scopus rating (2004): SJR 0.875 SNIP 0.747
Scopus rating (2003): SJR 0.934 SNIP 0.766
Scopus rating (2002): SJR 0.876 SNIP 0.909
Scopus rating (2001): SJR 0.898 SNIP 0.806
Scopus rating (2000): SJR 0.888 SNIP 0.796
Scopus rating (1999): SJR 0.973 SNIP 0.736
Original language: English
DOIs:
10.1007/s11120-011-9626-4
Indole-olefin-oxazoline (IndOlefOx)-ligands: synthesis and utilization in asymmetric Rh-catalyzed conjugate addition
Photochemistry of Dithiocarbamate Cu(II) Complex in CCl4

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Plyusnin, V. F., Kolomeets, A. V., Grivin, V. P., Larionov, S. V., Lemmetyinen, H.
Pages: 1763-1773
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry A
Volume: 115
Issue number: 10
ISSN (Print): 1089-5639
Ratings:
Scopus rating (2016): SJR 1.258 SNIP 0.98 CiteScore 2.64
Scopus rating (2015): SJR 1.179 SNIP 1.106 CiteScore 2.78
Scopus rating (2014): SJR 1.154 SNIP 1.071 CiteScore 2.65
Scopus rating (2013): SJR 1.194 SNIP 1.102 CiteScore 2.84
Scopus rating (2012): SJR 1.494 SNIP 1.124 CiteScore 2.78
Scopus rating (2011): SJR 1.402 SNIP 1.135 CiteScore 2.87
Scopus rating (2010): SJR 1.466 SNIP 1.102
Scopus rating (2009): SJR 1.562 SNIP 1.132
Scopus rating (2008): SJR 1.787 SNIP 1.093
Scopus rating (2007): SJR 1.907 SNIP 1.136
Scopus rating (2006): SJR 1.728 SNIP 1.195
Scopus rating (2005): SJR 1.789 SNIP 1.215
Scopus rating (2004): SJR 1.669 SNIP 1.224
Scopus rating (2003): SJR 1.75 SNIP 1.241
Scopus rating (2002): SJR 1.81 SNIP 1.196
Scopus rating (2001): SJR 1.732 SNIP 1.224
Scopus rating (2000): SJR 1.953 SNIP 1.272
Scopus rating (1999): SJR 1.507 SNIP 1.592
Original language: English
Photochromic processes in di(mercaptoquinolinato)Ni(II) complex and perfluordiphenyl disulfide solutions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Vorobyev, D., Kolomeets, A., Ivanov, Y., Bogdanchikov, G., Grivin, V., Plyusnin, V., Larionov, S., Lemmetyinen, H.
Pages: 1196-1202
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Photochemical & Photobiological Sciences
Volume: 10
Issue number: 7
ISSN (Print): 1474-905X
Ratings:
Scopus rating (2016): SJR 0.722 SNIP 0.799 CiteScore 2.37
Scopus rating (2015): SJR 0.805 SNIP 0.811 CiteScore 2.4
Scopus rating (2014): SJR 0.874 SNIP 0.946 CiteScore 2.55
Scopus rating (2013): SJR 0.989 SNIP 1.006 CiteScore 3
Scopus rating (2012): SJR 1.049 SNIP 0.919 CiteScore 2.73
Scopus rating (2011): SJR 1.013 SNIP 0.962 CiteScore 2.63
Scopus rating (2010): SJR 1.082 SNIP 0.927
Scopus rating (2009): SJR 0.983 SNIP 1.115
Scopus rating (2008): SJR 0.936 SNIP 0.872
Scopus rating (2007): SJR 1.09 SNIP 0.957
Scopus rating (2006): SJR 0.838 SNIP 0.914
Scopus rating (2005): SJR 0.938 SNIP 1.061
Scopus rating (2004): SJR 0.667 SNIP 1.098
Scopus rating (2003): SJR 0.492 SNIP 0.793
Original language: English
DOIs:
10.1039/c1pp05061c

Photocurrent generation in fullerene-phthalocyanine composite by in situ cationic polymerization

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Lintinen, K., Storbacka, L., Efimov, A., Tolkki, A., Tkachenko, N., Lemmetyinen, H.
Pages: 909-916
Publication date: 2011
Photoinduced electron transfer in a directly linked meso-triphenylamine zinc porphyrin-quinone dyad

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Pages: 391-400
Publication date: 2011
Peer-reviewed: Yes
Photoinduced intra- and intermolecular electron transfer in solutions and in solid organized molecular assemblies

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Lemmetyinen, H., Tkachenko, N. V., Efimov, A., Niemi, M.
Pages: 397-412
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Physical Chemistry Chemical Physics
Volume: 13
ISSN (Print): 1463-9076
Ratings:
Scopus rating (2016): CiteScore 4.06 SJR 1.678 SNIP 1.117
Scopus rating (2015): SJR 1.771 SNIP 1.244 CiteScore 4.45
Scopus rating (2014): SJR 1.772 SNIP 1.253 CiteScore 4.29
Scopus rating (2013): SJR 1.715 SNIP 1.216 CiteScore 4.05
Scopus rating (2012): SJR 1.916 SNIP 1.184 CiteScore 3.67
Scopus rating (2011): SJR 1.697 SNIP 1.203 CiteScore 3.6
Scopus rating (2010): SJR 1.802 SNIP 1.196
Scopus rating (2009): SJR 2.127 SNIP 1.369
Scopus rating (2008): SJR 2.158 SNIP 1.211
Scopus rating (2007): SJR 1.84 SNIP 1.138
Scopus rating (2006): SJR 1.467 SNIP 1.128
Scopus rating (2005): SJR 1.389 SNIP 1.104
Scopus rating (2004): SJR 1.173 SNIP 1.007
Scopus rating (2003): SJR 1.093 SNIP 0.925
Scopus rating (2002): SJR 1.122 SNIP 0.973
Scopus rating (2001): SJR 1.09 SNIP 0.914
Scopus rating (2000): SJR 0.948 SNIP 1.068
Scopus rating (1999): SJR 0.121 SNIP 0
Photoinduced processes in chromophore-gold nanoparticle assemblies

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Kotiaho, A., Lahtinen, R., Lemmetyinen, H.
Pages: 813-821
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Pure and Applied Chemistry
Volume: 83
Issue number: 4
ISSN (Print): 0033-4545
Ratings:
Scopus rating (2016): SJR 0.972 SNIP 1.049 CiteScore 2.45
Scopus rating (2015): SJR 0.885 SNIP 0.853 CiteScore 2.09
Scopus rating (2014): SJR 1.066 SNIP 1.244 CiteScore 2.76
Scopus rating (2013): SJR 1.134 SNIP 1.145 CiteScore 2.72
Scopus rating (2012): SJR 1.347 SNIP 1.224 CiteScore 2.8
Scopus rating (2011): SJR 1.215 SNIP 1.058 CiteScore 2.56
Scopus rating (2010): SJR 0.987 SNIP 0.882
Scopus rating (2009): SJR 1.185 SNIP 0.988
Scopus rating (2008): SJR 1.103 SNIP 1.086
Scopus rating (2007): SJR 1.266 SNIP 1.059
Scopus rating (2006): SJR 0.722 SNIP 0.943
Scopus rating (2005): SJR 0.778 SNIP 0.995
Scopus rating (2004): SJR 0.595 SNIP 0.834
Scopus rating (2003): SJR 0.815 SNIP 0.986
Scopus rating (2002): SJR 0.909 SNIP 0.828
Scopus rating (2001): SJR 0.452 SNIP 0.683
Scopus rating (2000): SJR 0.713 SNIP 0.532
Scopus rating (1999): SJR 0.795 SNIP 0.752
Original language: English
DOIs: 10.1351/PAC-CON-10-08-19

Photophysics and photoelectrochemical properties of nanohybrids consisting of fullerene-encapsulated single-walled carbon nanotubes and poly(3-hexylthiophene)

General information
State: Published
Poly(b-amino ester)-DNA complexes: Time-resolved fluorescence and cellular transfection studies
Preparation of triethylammonium tetra-arylborates (TETABs): coupling partners for the Suzuki reaction

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Kuuloja, N., Kylmälä, T. M., Tois, J. E., Sjöholm, R. E., Franzen, R. G.
Pages: 1052-1063
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Synthetic Communications
Volume: 41
ISSN (Print): 0039-7911

Ratings:
Scopus rating (2016): SJR 0.355 SNIP 0.392 CiteScore 1.09
Scopus rating (2015): SJR 0.36 SNIP 0.504 CiteScore 1.06
Scopus rating (2014): SJR 0.306 SNIP 0.462 CiteScore 0.96
Scopus rating (2013): SJR 0.367 SNIP 0.52 CiteScore 1.12
Scopus rating (2012): SJR 0.425 SNIP 0.567 CiteScore 1.17
Scopus rating (2011): SJR 0.432 SNIP 0.543 CiteScore 1.13
Scopus rating (2010): SJR 0.408 SNIP 0.493
Scopus rating (2009): SJR 0.459 SNIP 0.55
Scopus rating (2008): SJR 0.458 SNIP 0.522
Scopus rating (2007): SJR 0.47 SNIP 0.605
Scopus rating (2006): SJR 0.478 SNIP 0.618
Scopus rating (2005): SJR 0.425 SNIP 0.548
Scopus rating (2004): SJR 0.459 SNIP 0.612
Scopus rating (2003): SJR 0.496 SNIP 0.79
Scopus rating (2002): SJR 0.619 SNIP 0.744
Scopus rating (2001): SJR 0.659 SNIP 0.841
Scopus rating (2000): SJR 0.612 SNIP 0.827
Scopus rating (1999): SJR 0.559 SNIP 0.789

Original language: English
DOIs:
10.1016/j.jconrel.2011.06.016

Bibliographical note
Role of Polyplex Intermediate Species on Gene Transfer Efficiency: Polyethylenimine-DNA Complexes and Time-Resolved Fluorescence Spectroscopy

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Ketola, T., Hanzlikova, M., Urtti, A., Lemmetyinen, H., Yliperttula, M., Vuorimaa, E.
Pages: 1895-1902
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry Part B
Volume: 115
Issue number: 8
ISSN (Print): 1520-6106
Ratings:
Scopus rating (2016): CiteScore 3.03 SJR 1.348 SNIP 1.02
Scopus rating (2015): SJR 1.367 SNIP 1.096 CiteScore 3.25
Scopus rating (2014): SJR 1.44 SNIP 1.14 CiteScore 3.28
Scopus rating (2013): SJR 1.494 SNIP 1.2 CiteScore 3.53
Scopus rating (2012): SJR 1.92 SNIP 1.251 CiteScore 3.66
Scopus rating (2011): SJR 1.78 SNIP 1.226 CiteScore 3.62
Scopus rating (2010): SJR 1.849 SNIP 1.214
Scopus rating (2009): SJR 2.232 SNIP 1.349
Scopus rating (2008): SJR 2.543 SNIP 1.381
Scopus rating (2007): SJR 2.346 SNIP 1.282
Scopus rating (2006): SJR 2.369 SNIP 1.415
Scopus rating (2005): SJR 2.275 SNIP 1.474
Scopus rating (2004): SJR 2.148 SNIP 1.511
Scopus rating (2003): SJR 2.034 SNIP 1.47
Scopus rating (2002): SJR 2.118 SNIP 1.496
Scopus rating (2001): SJR 2.053 SNIP 1.508
Scopus rating (2000): SJR 2.145 SNIP 1.527
Scopus rating (1999): SJR 1.713 SNIP 1.8
Original language: English
DOIs:
10.1021/jp109984c

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Source: researchoutputwizard
Source-ID: 6357
Research output: Scientific - peer-review › Article

Self-assembled monolayers (SAMs) of porphyrin deposited inside photonic crystal fibre (PCF)

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Veselov, A. A., Thur, C., Efimov, A., Guina, M., Lemmetyinen, H., Tkachenko, N. V.
Structure of porphyrin-fullerene dyad monolayer on the water surface and solid substrate

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Number of pages: 7
Pages: 157-163
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Crystallography Reports
Volume: 56
Issue number: 1
ISSN (Print): 1063-7745
Ratings:
Scopus rating (2016): SJR 0.313 SNIP 0.644 CiteScore 0.55
Study of PEGylated Lipid Layers as a Model for PEGylated Liposome Surfaces: Molecular Dynamics Simulation and Langmuir Monolayer Studies

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Chemistry and Bioengineering, Department of Physics, Research group: Supramolecular photochemistry, Computational Science X (CompX), Frontier Photonics
Pages: 7788-7798
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Langmuir
Volume: 27
Issue number: 12
ISSN (Print): 0743-7463
Ratings:
Scopus rating (2016): CiteScore 3.99 SJR 1.55 SNIP 1.188
Scopus rating (2015): SJR 1.686 SNIP 1.308 CiteScore 4.33
Scopus rating (2014): SJR 1.816 SNIP 1.391 CiteScore 4.59
Scopus rating (2013): SJR 1.895 SNIP 1.356 CiteScore 4.55
Scopus rating (2012): SJR 2.177 SNIP 1.382 CiteScore 4.37
Scopus rating (2011): SJR 2.051 SNIP 1.357 CiteScore 4.42
Scopus rating (2010): SJR 2.148 SNIP 1.4
Scopus rating (2009): SJR 2.156 SNIP 1.351
Scopus rating (2008): SJR 2.383 SNIP 1.34
Scopus rating (2007): SJR 2.449 SNIP 1.434
Synthesis and photovoltaic properties of thiopheneimide-fused thiophene alternating copolymers with different alkyl side chains

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Umeyama, T., Oodoi, M., Yoshikawa, O., Sagawa, T., Yoshikawa, S., Evgenia, D., Tezuka, N., Matano, Y., Stranius, K., Tkachenko, N., Lemmetyinen, H., Imahori, H.
Pages: 12454-12461
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Chemistry
Volume: 21
Issue number: 33
ISSN (Print): 0959-9428
Ratings:
Scopus rating (2015): SJR 2.452 SNIP 2.236
Scopus rating (2014): SJR 2.457 SNIP 2.296
Scopus rating (2013): SJR 2.249 SNIP 1.84
Scopus rating (2012): SJR 2.771 SNIP 1.523
Scopus rating (2011): SJR 2.616 SNIP 1.565
Scopus rating (2010): SJR 2.602 SNIP 1.484
Scopus rating (2009): SJR 2.526 SNIP 1.529
Scopus rating (2008): SJR 2.587 SNIP 1.658
Scopus rating (2007): SJR 2.623 SNIP 1.591
Scopus rating (2006): SJR 2.375 SNIP 1.551
Scopus rating (2005): SJR 1.983 SNIP 1.501
Scopus rating (2004): SJR 1.525 SNIP 1.356
Scopus rating (2003): SJR 1.509 SNIP 1.39
Scopus rating (2002): SJR 1.617 SNIP 1.505
Scopus rating (2001): SJR 1.479 SNIP 1.552
Scopus rating (2000): SJR 1.386 SNIP 1.35
Scopus rating (1999): SJR 1.263 SNIP 1.423
Original language: English
DOIs:
10.1021/la200003n

10.1039/C1JM11531F
The excited states of a porphine-quinone complex under an external electrostatic field calculated by TDDFT

Ultrafast excitation transfer and charge stabilization in an newly assembled photosynthetic antenna-reaction center mimic composed of boron dipyrrin, zinc porphyrin and fullerene
Ultrafast pump-probe spectroscopy of IrCl62- complex in alcohol solutions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry, Frontier Photonics
Authors: Glebov, E., Kolomeets, A., Pozdnyakov, I., Plyusnin, V., Tkachenko, N. V., Lemmetyinen, H.
Pages: 1709-1714
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Photochemical & Photobiological Sciences
Volume: 10
Issue number: 10
ISSN (Print): 1474-905X
Ratings:
Scopus rating (2016): SJR 0.722 SNIP 0.799 CiteScore 2.37
Scopus rating (2015): SJR 0.805 SNIP 0.811 CiteScore 2.4
Scopus rating (2014): SJR 0.874 SNIP 0.946 CiteScore 2.55
Utilization of IndPHOX-ligands in palladium-catalysed asymmetric allylic aminations

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Wang, Y., Vaismaa, M., Hämäläinen, A., Tois, J., Franzen, R.
Pages: 524-529
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Tetrahedron : Asymmetry
Volume: 22
Issue number: 5
ISSN (Print): 0957-4166
Ratings:
Scopus rating (2016): SJR 0.751 SNIP 0.663 CiteScore 2.05
Scopus rating (2015): SJR 0.777 SNIP 0.713 CiteScore 2.04
Scopus rating (2014): SJR 0.75 SNIP 0.723 CiteScore 2.12
Scopus rating (2013): SJR 0.965 SNIP 0.725 CiteScore 2.24
Scopus rating (2012): SJR 1.037 SNIP 0.748 CiteScore 2.15
Scopus rating (2011): SJR 1.288 SNIP 0.839 CiteScore 2.69
Scopus rating (2010): SJR 1.292 SNIP 0.904
Scopus rating (2009): SJR 1.275 SNIP 0.84
Scopus rating (2008): SJR 1.481 SNIP 0.853
Scopus rating (2007): SJR 1.534 SNIP 0.868
Scopus rating (2006): SJR 1.425 SNIP 0.925
Scopus rating (2005): SJR 1.275 SNIP 0.902
Scopus rating (2004): SJR 1.302 SNIP 0.974
Scopus rating (2003): SJR 1.181 SNIP 0.966
Scopus rating (2002): SJR 1.525 SNIP 0.924
Scopus rating (2001): SJR 1.533 SNIP 1.074
Scopus rating (2000): SJR 1.764 SNIP 1.102
Scopus rating (1999): SJR 1.599 SNIP 1.036
Original language: English
Photopolymerizable liquid fullerene, phthalocyanine and porphyrin derivatives: synthesis, analysis and photocurrent generation

Photopolymerizable liquid monomers of fullerene, phthalocyanine and porphyrin were synthesized, polymerized and used as photoactive materials in organic solar cell structures. The design of the molecules requires the combination of three major parts: the functional core of the original molecules, alkyllic side chains for liquid state and polymerizable end groups. The harsh conditions of the chromophore synthesis require a modular design, where the chromophore core and polymerizable tails are synthesized separately, and combined later by mild acylation. A means of ultra-thin-film polymerization, both photo and thermal, were devised. All of the chromophores could be polymerized as ultrathin films. Because of their high absorbances, it was possible to use UV-Vis spectroscopy to monitor polymerization indirectly; as the films were of only a few monomer units thick, it was possible to dissolve the unreacted monomer residues afterwards and thus determine polymerization degrees as a function of the absorbance of the polymerized film. The molecules were studied extensively to yield the parameters for thin film preparation, photopolymerization, and photocurrent generation. While the monomers were liquid at room temperature, the hardness of the polymers was that of crosslinked epoxy plastics. The porphyrin monomer was used to study photopolymerization kinetics due to its unique self-photoinitiating properties. Polarization modulation IR spectroscopy was used to study real-time photopolymerization of the porphyrin monomer at varying temperatures, yielding rate constants and the activation energy of the reaction. It was the first published study of ultra-thin-film polymerization kinetics. The monomers employed in this work were optimized for easy photopolymerizability and as such produced unoptimal power conversion efficiency. Nevertheless the basic structure of the polymer lends itself well to modification for improved organic photovoltaic performance.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Chemistry and Bioengineering
Authors: Lintinen, K.
Number of pages: 96
Publication date: 3 Dec 2010

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 942
ISSN (Print): 1459-2045
Electronic versions:
lintinen.pdf
Links:
http://urn.fi/URN:NBN:fi:tty-201011111359

Bibliographical note
Awarding institution: Tampere University of Technology
Source: researchoutputwizard
Source-ID: 8651
Research output: Collection of articles › Doctoral Thesis

Computational study of charge transfer in a porphine: quinone complex and novel alkoxypyridylindolizine derivatives
Finding ways to control electron transfer (ET) between molecules or molecular systems and to investigate efficient theoretical methods capable of describing ET is important for being able to design better molecular electronic devices. In this Thesis the capability of computational methods based on density functional theory (DFT) to describe charge transfer is
studied in two molecular systems. In addition, the possibility to control ET by strong electric fields is investigated. The molecular structure and excited states of three alkoxyypyridylindolizine derivatives are studied by using DFT and time-dependent DFT (TDDFT). In addition, the influence of an external electrostatic field of the order of magnitude of 109 V/m and of an electric field induced by ambient helical peptides on ET in a porphine–2,5-dimethyl-1,4-benzoquinone (PQ) complex is studied with TDDFT and the approximate coupled cluster singles and doubles (CC2) method. The calculations show that the absorption spectra of the studied indolizine derivatives are characterized by a band arising from the intramolecular CT between the indolizine ring and the pyridyl substituent attached to it and the hybrid functionals reproduce the experimental absorption spectra of the derivatives well within TDDFT. However, the same functionals are not as good in describing the fluorescence properties of the indolizine derivatives, namely the CT excited state of a derivative is obtained with too low an energy, which prevents the relaxation of the correct state. This problem can be circumvented by applying an exchange-correlation (XC) functional with a high fraction of Hartree–Fock (HF) exchange but this is done in the expense of the quantitative accuracy. According to the calculations, perturbation generated either by an external electrostatic field or by ambient Aib peptides affects the energies of the locally excited Q and B states of porphine in the PQ complex clearly less than the energy of the lowest CT state. Hence, it is possible to select a locally excited state (Q or B) of the PQ complex whose photoexcitation leads to ET from porphine to quinone. The results presented show that TDDFT applied with the current XC functionals provides an efficient way to study the qualitative picture of the excited states under the influence of an external electric field.

General information
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Chemistry and Bioengineering
Authors: Aittala, P.
Number of pages: 87
Publication date: 26 Nov 2010

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-2479-0
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 936
ISSN (Print): 1459-2045
Electronic versions:
aittala.pdf
Links:
http://urn.fi/URN:NBN:fi:tty-201011051351

Bibliographical note
Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source-ID: 7642
Research output: Monograph › Doctoral Thesis

Multilayered thin films for organic photovoltaics
This work investigates the photoinduced interactions between different organic chromophores, thus identifying possible materials for organic photovoltaic applications. The intermolecular electron transfer (ET) in layered structures centered on a covalently bridged porphyrin–fullerene dyad (P–F) was studied by means of electrical and spectroscopic methods. When excited, the dyad initiates the vectorial ET in the films, and secondary processes take place after the charge separation between the porphyrin and fullerene moieties of P–F. This study showed that violanthrone-79 (V-79) and two different perylene derivatives (PDI and PTCDI) were capable to accept electrons from the photoinduced fullerene anion of P–F. Longer-lived electrical and spectroscopic signals were achieved when the film structures were expanded to multilayered configurations containing an electron-donor, the P–F dyad, and an electron-acceptor. The electron-donor material used was poly(3-hexylthiophene) (PHT). The film deposition technique was switched from the Langmuir–Blodgett (LB) to Langmuir–Schäfer (LS) or thermal evaporation methods in order to achieve stronger photoelectrical signal amplitudes. As a result of the information gained in the ET studies, photovoltaic devices were prepared based on the studied compounds. The photocurrent generated from the ultrathin film systems studied in this Thesis can be easily measured with a three-electrode photoelectrochemical cell. In fact, the deposition of a metal top-electrode on the solar cell would damage the underlying organics, thus leading to short-circuiting problems. However, since the liquid cells suffer of poor performances and low stability, it was aimed to build layered cells with a metal top-electrode. The first step in this direction was the optimization of the organics|top-electrode junction, in order to protect the thin organic films. This was achieved with the
introduction of a thin tris-8-hydroxy-quinolato aluminum (Alq3) layer in the cell, which successfully enhanced both the efficiency and the lifetime of the devices. Finally, multilayered cells based on a donor–acceptor pair sandwiched between an electron-donor and an electron-acceptor were developed, demonstrating that it is possible to design photovoltaic devices starting from the valuable information offered by the ET studies. The molecule chosen to this aim was the phthalocyanine-fullerene dyad, H2Pc–C60ee, which could be easily deposited as spin-coated layer.

General information
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Chemistry and Bioengineering
Authors: Vivo, P.
Number of pages: 86
Publication date: 29 Oct 2010

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 918
ISSN (Print): 1459-2045
Electronic versions:
vivo.pdf
Links:
http://urn.fi/URN:NBN:fi:tty-201010071329

Bibliographical note
Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source-ID: 9598
Research output: Monograph › Doctoral Thesis

Boronic Acids and Esters in the Petasis-Borono Mannich Multicomponent Reaction

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Candeias, N. R., Montalbano, F., Cal, P. M. S. D., Gois, P. M. P.
Number of pages: 25
Pages: 6169-6193
Publication date: Oct 2010
Peer-reviewed: Yes

Publication information
Journal: Chemical Reviews
Volume: 110
Issue number: 10
ISSN (Print): 0009-2665
Ratings:
Scopus rating (2016): SJR 19.282 SNIP 10.369 CiteScore 42.79
Scopus rating (2015): SJR 18.373 SNIP 11.51 CiteScore 45.92
Scopus rating (2014): SJR 18.369 SNIP 11.47 CiteScore 44.56
Scopus rating (2013): SJR 22.176 SNIP 12.915 CiteScore 49.12
Scopus rating (2012): SJR 20.511 SNIP 11.43 CiteScore 39.08
Scopus rating (2011): SJR 19.538 SNIP 11.534 CiteScore 39.19
Scopus rating (2010): SJR 18.393 SNIP 11.114
NHC-Iron-Catalyzed Aerobic Oxidative Aromatic Esterification of Aldehydes using Boronic Acids

NHC Iron complexes prepared in situ very efficiently afforded benzoates via the aerobic oxidative aromatic esterification of aldehydes with boronic acids. This method uses equimolar amounts of both the aldehyde and the boronic acid allowing the preparation of benzoates in yields up to 97%.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Univ Lisbon, Universidade de Lisboa, Fac Farm, iMed UL
Authors: Rosa, J. N., Reddy, R. S., Candeias, N. R., Cal, P. M. S. D., Gois, P. M. P.
Number of pages: 4
Pages: 2686-2689
Publication date: 18 Jun 2010
Peer-reviewed: Yes

Publication information
Journal: Organic Letters
Volume: 12
Issue number: 12
ISSN (Print): 1523-7060
Ratings:
Scopus rating (2016): SJR 2.964 SNIP 1.218 CiteScore 6.32
Scopus rating (2015): SJR 3.055 SNIP 1.336 CiteScore 6.38
Scopus rating (2014): SJR 2.958 SNIP 1.324 CiteScore 6.18
Scopus rating (2013): SJR 3.144 SNIP 1.329 CiteScore 6.12
Scopus rating (2012): SJR 3.312 SNIP 1.355 CiteScore 5.7
Scopus rating (2011): SJR 3.271 SNIP 1.377 CiteScore 5.81
Scopus rating (2010): SJR 2.985 SNIP 1.307
Scopus rating (2009): SJR 3.048 SNIP 1.37
Scopus rating (2008): SJR 3.263 SNIP 1.295
Scopus rating (2007): SJR 3.185 SNIP 1.296
Scopus rating (2006): SJR 2.936 SNIP 1.352
Scopus rating (2005): SJR 2.552 SNIP 1.329
Scopus rating (2004): SJR 2.515 SNIP 1.262
Scopus rating (2003): SJR 2.451 SNIP 1.325
Scopus rating (2002): SJR 2.787 SNIP 1.311
Scopus rating (2001): SJR 2.266 SNIP 1.427
New dirhodium complex with activity towards colorectal cancer

A novel dirhodium complex (Rh(2)[L-PheAla](2)(OAc)(2) is reported with strong activity towards human colon adenocarcinoma cells. Its effect was not accompanied by generation of reactive oxygen species (ROS) neither by activation of caspase-3. (C) 2010 Elsevier Ltd. All rights reserved.

General information

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Authors: Frade, R. F. M., Candeias, N. R., Duarte, C. M. M., Andre, V., Duarte, M. T., Gois, P. M. P., Afonso, C. A. M.

Number of pages: 3
Pages: 3413-3415
Publication date: 1 Jun 2010
Peer-reviewed: Yes

Publication information

Journal: Bioorganic and Medicinal Chemistry Letters
Volume: 20
Issue number: 11
ISSN (Print): 0960-894X

Ratings:
- Scopus rating (2016): SJR 0.843 SNIP 0.846 CiteScore 2.52
- Scopus rating (2015): SJR 0.932 SNIP 0.884 CiteScore 2.55
- Scopus rating (2014): SJR 0.94 SNIP 0.89 CiteScore 2.43
- Scopus rating (2013): SJR 0.931 SNIP 0.911 CiteScore 2.47
- Scopus rating (2012): SJR 1.087 SNIP 0.936 CiteScore 2.49
- Scopus rating (2011): SJR 1.127 SNIP 0.991 CiteScore 2.7
- Scopus rating (2010): SJR 1.065 SNIP 0.987
- Scopus rating (2009): SJR 1.114 SNIP 1.022
- Scopus rating (2008): SJR 1.111 SNIP 0.984
- Scopus rating (2007): SJR 1.111 SNIP 0.962
- Scopus rating (2006): SJR 0.971 SNIP 0.955
- Scopus rating (2005): SJR 0.961 SNIP 0.81
- Scopus rating (2004): SJR 0.921 SNIP 0.952
- Scopus rating (2003): SJR 0.849 SNIP 0.845
- Scopus rating (2002): SJR 0.876 SNIP 0.832
- Scopus rating (2001): SJR 0.808 SNIP 0.728
- Scopus rating (2000): SJR 0.924 SNIP 0.677
- Scopus rating (1999): SJR 0.875 SNIP 0.691

Original language: English

Keywords: Dirhodium complex, Human colon adenocarcinoma cells, ANTITUMOR-ACTIVITY, IN-VITRO, RHODIUM(II) CARBOXYLATES, CELL-DEATH, BIOLOGICAL-ACTIVITY, STRUCTURAL EVIDENCE, CRYSTAL-STRUCTURES, GUANINE BASES, METAL-BINDING, CISPLATIN

DOIs:
- 10.1016/j.bmcl.2010.04.002
Source: WOS
Source-ID: 000277788900047
Research output: Scientific - peer-review Article
Dimeric Quinidine-Catalyzed Enantioselective Aminooxygenation of Oxindoles: An Organocatalytic Approach to 3-Hydroxyoxindole Derivatives

3-Hydroxyoxindoles are common structural motifs found in a vast array of natural and biologically active molecules. Most catalytic methods for the asymmetric syntheses of these compounds require the use of transition-metal catalysts. In contrast, alternative catalytic procedures involving organocatalysis are scarce. Herein we disclose a novel aminooxygenation of oxindoles with nitrosobenzene catalyzed by a newly designed quinidine dimer to afford the desired products in good yields with enantioselectivities up to 96%. These reactions allow one to construct a C-O bond at the C(3) position of oxindoles with the creation of an oxygen-containing tetrasubstituted chiral center and provide a new, general organocatalytic approach to the synthesis of 3-hydroxyoxindole derivatives.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Bui, T., Candeias, N. R., Barbas, C. F.
Number of pages: 2
Pages: 5574-5575
Publication date: 28 Apr 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of the American Chemical Society
Volume: 132
Issue number: 16
ISSN (Print): 0002-7863
Ratings:
Scopus rating (2016): SJR 7.368 SNIP 2.584 CiteScore 13.18
Scopus rating (2015): SJR 6.826 SNIP 2.632 CiteScore 12.81
Scopus rating (2014): SJR 6.273 SNIP 2.578 CiteScore 11.92
Scopus rating (2013): SJR 5.953 SNIP 2.455 CiteScore 11.38
Scopus rating (2012): SJR 6.141 SNIP 2.379 CiteScore 10.37
Scopus rating (2011): SJR 5.447 SNIP 2.336 CiteScore 9.94
Scopus rating (2010): SJR 5.076 SNIP 2.132
Scopus rating (2009): SJR 4.883 SNIP 2.176
Scopus rating (2008): SJR 4.936 SNIP 2.116
Scopus rating (2007): SJR 5.023 SNIP 2.126
Scopus rating (2006): SJR 4.546 SNIP 2.22
Scopus rating (2005): SJR 4.284 SNIP 2.207
Scopus rating (2004): SJR 3.754 SNIP 2.178
Scopus rating (2003): SJR 3.267 SNIP 2.215
Scopus rating (2002): SJR 3.527 SNIP 2.346
Scopus rating (2001): SJR 3.449 SNIP 2.199
Scopus rating (2000): SJR 3.573 SNIP 2.224
Scopus rating (1999): SJR 3.56 SNIP 2.182
Original language: English
Keywords: ASYMMETRIC ADDITION, ARYLBORONIC ACIDS, ISATINS, HYDROXYLATION, NITROALKENES, 2-OXINDOLES, ALKALOIDS, ACCESS
DOI:
10.1021/ja101032j
Source: WOS
Source-ID: 000276991700020
Research output: Scientific - peer-review > Article

Water as the reaction medium for multicomponent reactions based on boronic acids
Water is a suitable medium for the Petasis-borono-Mannich multicomponent reaction Salicylaldehyde, glyoxalic acid, glycoaldehyde and glyoxal were reacted with several boronic acids and different amines affording alkylaminophenols, 2H-chromenes, alpha-amino acids, alpha-amino alcohols and 2-hydroxymorpholines in good to high yields An efficient new one-pot method for the assembly of boron-heterocycles based on amino-acids, boronic acids and salicylaldehyde using water as the reaction media is presented The mechanisms of these reactions were studied by means of OFF calculations,
and the effect of solvent on the calculated energy barriers was addressed, for different aldehydes (C) 2010 Elsevier Ltd All rights reserved

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Univ Lisbon, Universidade de Lisboa, Fac Farm, IMed UL, Inst Super Tecn, Instituto Superior Tecnico, Universidade de Lisboa, Dept Engn Quim & Biol, Ctr Quim Estrutural
Authors: Candeias, N. R., Cal, P. M. S. D., Andre, V., Duarte, M. T., Veiros, L. F., Gois, P. M. P.
Number of pages: 10
Pages: 2736-2745
Publication date: 3 Apr 2010
Peer-reviewed: Yes

Publication information
Journal: Tetrahedron
Volume: 66
Issue number: 14
ISSN (Print): 0040-4020
Ratings:
Scopus rating (2016): SJR 0.907 SNIP 0.742 CiteScore 2.54
Scopus rating (2015): SJR 0.954 SNIP 0.84 CiteScore 2.72
Scopus rating (2014): SJR 0.971 SNIP 0.905 CiteScore 2.79
Scopus rating (2013): SJR 1.101 SNIP 0.92 CiteScore 2.85
Scopus rating (2012): SJR 1.32 SNIP 0.999 CiteScore 2.89
Scopus rating (2011): SJR 1.476 SNIP 1.094 CiteScore 3.22
Scopus rating (2010): SJR 1.508 SNIP 1.065
Scopus rating (2009): SJR 1.534 SNIP 1.124
Scopus rating (2008): SJR 1.579 SNIP 1.078
Scopus rating (2007): SJR 1.639 SNIP 1.116
Scopus rating (2006): SJR 1.507 SNIP 1.142
Scopus rating (2005): SJR 1.354 SNIP 1.138
Scopus rating (2004): SJR 1.459 SNIP 1.261
Scopus rating (2003): SJR 1.448 SNIP 1.265
Scopus rating (2002): SJR 1.677 SNIP 1.177
Scopus rating (2001): SJR 1.46 SNIP 1.178
Scopus rating (2000): SJR 1.536 SNIP 1.165
Scopus rating (1999): SJR 1.37 SNIP 1.172
Original language: English
Keywords: Boron, Multicomponent reactions, Petasis reaction, Boron heterocycles, MOLECULAR-ORBITAL METHODS, DIELS-ALDER REACTIONS, POLARIZABLE CONTINUUM MODEL, GAUSSIAN-TYPE BASIS, ALPHA-AMINO-ACIDS, ORGANIC-REACTIONS, EQUILIBRIUM GEOMETRIES, TRANSITION-STATES, MANNICH REACTIONS, SOLVATION MODELS
DOI:
10.1016/j.tet.2010.01.084
Source: WOS
Source-ID: 000276371000026
Research output: Scientific - peer-review Article

Absolute probe of surface chirality based on focused circularly polarized light

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Nonlinear Optics, Research area: Optics, Department of Chemistry and Bioengineering, Department of Physics, Research group: Supramolecular photochemistry
Authors: Huttunen, M. J., Virkki, M., Erkintalo, M., Vuorimaa, E., Efimov, A., Lemmetyinen, H., Kauranen, M.
Pages: 1826-1829
Publication date: 2010
Peer-reviewed: Yes
A novel and efficient synthesis of 3-aminomethyl-N-tosyl-indazoles

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Kylmälä, T., Hämäläinen, A., Kuuloja, N., Tois, J., Franzen, R.
Pages: 8854-8861
Publication date: 2010
Peer-reviewed: Yes

**Publication information**
Journal: Tetrahedron
Volume: 66
Issue number: 46
ISSN (Print): 0040-4020
Ratings:
Scopus rating (2016): SJR 0.907 SNIP 0.742 CiteScore 2.54
Scopus rating (2015): SJR 0.954 SNIP 0.84 CiteScore 2.72
Scopus rating (2014): SJR 0.971 SNIP 0.905 CiteScore 2.79
Scopus rating (2013): SJR 1.101 SNIP 0.92 CiteScore 2.85
Scopus rating (2012): SJR 1.32 SNIP 0.999 CiteScore 2.89
A TDDFT study of the fluorescence properties of three alkoxyppyridylindolizine derivatives

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Department of Physics, Research group: Supramolecular photochemistry
Authors: Aittala, P. J., Cramariuc, O., Hukka, T. I., Vasilescu, M., Bandula, R., Lemmetyinen, H.
Pages: 7094-7101
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry A
Volume: 114
Issue number: 26
ISSN (Print): 1089-5639
Ratings:
Scopus rating (2016): SJR 1.258 SNIP 0.98 CiteScore 2.64
Scopus rating (2015): SJR 1.179 SNIP 1.106 CiteScore 2.78
Scopus rating (2014): SJR 1.154 SNIP 1.071 CiteScore 2.65
Scopus rating (2013): SJR 1.194 SNIP 1.102 CiteScore 2.84
Scopus rating (2012): SJR 1.494 SNIP 1.124 CiteScore 2.78
Scopus rating (2011): SJR 1.402 SNIP 1.135 CiteScore 2.87
Scopus rating (2010): SJR 1.466 SNIP 1.102
Scopus rating (2009): SJR 1.562 SNIP 1.132
Scopus rating (2008): SJR 1.787 SNIP 1.093
Scopus rating (2007): SJR 1.907 SNIP 1.136
Scopus rating (2006): SJR 1.728 SNIP 1.195
Scopus rating (2005): SJR 1.789 SNIP 1.215
Scopus rating (2004): SJR 1.669 SNIP 1.224
Scopus rating (2003): SJR 1.75 SNIP 1.241
Scopus rating (2002): SJR 1.81 SNIP 1.196
Scopus rating (2001): SJR 1.732 SNIP 1.224
Scopus rating (2000): SJR 1.953 SNIP 1.272
Carrier dynamics in 1300 nm AlGaInAs quantum wells metamorphically grown on GaAs

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre, Department of Chemistry and Bioengineering
Authors: Hakkarainen, T., Gubanov, A., Toikkanen, L., Tkachenko, N., Guina, M.
Pages: 79
Publication date: 2010

Host publication information
Title of host publication: Optics Days 2010 Proceedings, May 6-7, 2010, Tampere, Finland
Editor: Reith, C.

Catalytic asymmetric total synthesis of tangutorine

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Pages: 872-875
Publication date: 2010
Peer-reviewed: Yes
Close proximity dibenzo[a,c]phenazine-fullerene dyad: synthesis and photoinduced singlet energy transfer

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Dubey, R. K., Kumpulainen, T., Efimov, A., Tkachenko, N. V., Lemmetyinen, H.
Pages: 3428-3436
Publication date: 2010
Peer-reviewed: Yes

Publication information
Volume: 2010
Issue number: 18
ISSN (Print): 1434-193X
Ratings:
Scopus rating (2016): CiteScore 2.74 SJR 1.133 SNIP 0.653
Scopus rating (2015): SJR 1.198 SNIP 0.758 CiteScore 2.88
Scopus rating (2014): SJR 1.181 SNIP 0.767 CiteScore 2.96
Scopus rating (2013): SJR 1.292 SNIP 0.796 CiteScore 2.96
Scopus rating (2012): SJR 1.471 SNIP 0.811 CiteScore 2.93
Scopus rating (2011): SJR 1.536 SNIP 0.857 CiteScore 3.2
Scopus rating (2010): SJR 1.572 SNIP 0.785
Scopus rating (2009): SJR 1.497 SNIP 0.778
Scopus rating (2008): SJR 1.652 SNIP 0.759
Scopus rating (2007): SJR 1.711 SNIP 0.84
Scopus rating (2006): SJR 1.505 SNIP 0.849
Scopus rating (2005): SJR 1.246 SNIP 0.763
Scopus rating (2004): SJR 1.2 SNIP 0.81
Scopus rating (2003): SJR 1.19 SNIP 0.802
Scopus rating (2002): SJR 1.382 SNIP 0.829
Scopus rating (2001): SJR 1.159 SNIP 0.816
Scopus rating (2000): SJR 1.192 SNIP 1.048
Scopus rating (1999): SJR 0.877 SNIP 0.976
Original language: English
DOIs:
10.1021/ol902929a

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Source: researchoutputwizard
Source-ID: 8831
Research output: Scientific - peer-review › Article
Copper-catalyzed cyclization of Z-oximes into 3-methyl-1,2-benzisoxazoles

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Udd, S., Jokela, R., Franzen, R., Tois, J.
Pages: 1030-1033
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Tetrahedron Letters
Volume: 51
ISSN (Print): 0040-4039
Ratings:
Scopus rating (2016): SJR 0.754 SNIP 0.635 CiteScore 2.13
Scopus rating (2015): SJR 0.757 SNIP 0.747 CiteScore 2.3
Scopus rating (2014): SJR 0.794 SNIP 0.796 CiteScore 2.41
Scopus rating (2013): SJR 0.904 SNIP 0.802 CiteScore 2.4
Scopus rating (2012): SJR 1.084 SNIP 0.844 CiteScore 2.45
Scopus rating (2011): SJR 1.216 SNIP 0.949 CiteScore 2.76
Scopus rating (2010): SJR 1.232 SNIP 0.916
Scopus rating (2009): SJR 1.289 SNIP 0.937
Scopus rating (2008): SJR 1.325 SNIP 0.881
Scopus rating (2007): SJR 1.443 SNIP 0.956
Scopus rating (2006): SJR 1.301 SNIP 0.925
Scopus rating (2005): SJR 1.243 SNIP 0.949
Scopus rating (2004): SJR 1.294 SNIP 0.963
Scopus rating (2003): SJR 1.28 SNIP 0.994
Scopus rating (2002): SJR 1.684 SNIP 1.025
Scopus rating (2001): SJR 1.477 SNIP 1.009
Scopus rating (2000): SJR 1.621 SNIP 1.007
Scopus rating (1999): SJR 1.5 SNIP 1.015
Original language: English
DOIs:
10.1016/j.tetlet.2009.12.070

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Source: researchoutputwizard
Source-ID: 9456
Research output: Scientific - peer-review › Article

Directed photocurrent in Languir-Schaefer organic molecular films

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Alekseev, A., Efimov, A. V., Chukharev, V. I., Lemmetyinen, H.
Pages: 136-140
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Bulletin of the Lebedev Physics Institute
Volume: 37
Issue number: 5
Effect of hot drawing on properties of wet-spun poly(L,D-lactide) copolymer multifilament fibers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Department of Chemistry and Bioengineering, Department of Biomedical Engineering, Research group: Supramolecular photochemistry
Authors: Rissanen, M., Puolakka, A., Hukka, T., Ellä, V., Kellomäki, M., Nousiainen, P.
Pages: 608-615
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Applied Polymer Science
Volume: 115
Issue number: 1
ISSN (Print): 0021-8995

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Source: researchoutputwizard
Source-ID: 7667
Research output: Scientific - peer-review › Article

Effect of hot drawing on properties of wet-spun poly(L,D-lactide) copolymer multifilament fibers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Department of Chemistry and Bioengineering, Department of Biomedical Engineering, Research group: Supramolecular photochemistry
Authors: Rissanen, M., Puolakka, A., Hukka, T., Ellä, V., Kellomäki, M., Nousiainen, P.
Pages: 608-615
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Applied Polymer Science
Volume: 115
Issue number: 1
ISSN (Print): 0021-8995

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Source: researchoutputwizard
Source-ID: 7667
Research output: Scientific - peer-review › Article
Effects of δ-elongation and the fused position of quinoxaline-fused porphyrins as sensitizers in dye-sensitized solar cells on optical, electrochemical, and photovoltaic properties

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Pages: 11293-11304
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 114
Issue number: 25
ISSN (Print): 1932-7447
Ratings:
Scopus rating (2016): CiteScore 4.48 SJR 1.948 SNIP 1.181
Scopus rating (2015): SJR 1.917 SNIP 1.268 CiteScore 4.68
Scopus rating (2014): SJR 2.027 SNIP 1.448 CiteScore 5.08
Scopus rating (2013): SJR 2.134 SNIP 1.439 CiteScore 5.14
Scopus rating (2012): SJR 2.514 SNIP 1.46 CiteScore 4.98
Scopus rating (2011): SJR 2.32 SNIP 1.457 CiteScore 4.92
Scopus rating (2010): SJR 2.438 SNIP 1.356
Scopus rating (2009): SJR 2.128 SNIP 1.417
Scopus rating (2008): SJR 1.856 SNIP 1.033
Original language: English
DOIs:
10.1021/jp1004049

Bibliographical note
Contribution: organisation=mol
Source: researchoutputwizard
Source-ID: 9121
Research output: Scientific - peer-review Article

Effects of meso-diarylamino group of porphyrins as sensitizers in dye-sensitized solar cells on optical, electrochemical, and photovoltaic properties

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Pages: 10656-10665
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 114
Issue number: 23
ISSN (Print): 1932-7447
Electric-field-assisted electron transfer in a porphine-quinone complex: A theoretical study

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Department of Physics, Research group: Supramolecular photochemistry
Authors: Aittala, P. J., Cramariuc, O., Hukka, T. I.
Pages: 805-816
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Chemical Theory and Computation
Volume: 6
Issue number: 3
ISSN (Print): 1549-9618

Ratings:
Scopus rating (2016): SJR 2.801 SNIP 1.589 CiteScore 5.37
Scopus rating (2015): SJR 2.795 SNIP 1.748 CiteScore 5.65
Scopus rating (2014): SJR 2.777 SNIP 1.603 CiteScore 5.63
Scopus rating (2013): SJR 2.409 SNIP 1.578 CiteScore 5.41
Scopus rating (2012): SJR 2.744 SNIP 1.608 CiteScore 5.34
Scopus rating (2011): SJR 2.742 SNIP 1.815 CiteScore 5.82
Scopus rating (2010): SJR 2.372 SNIP 1.46
Scopus rating (2009): SJR 2.616 SNIP 1.273
Scopus rating (2008): SJR 2.367 SNIP 1.173
Scopus rating (2007): SJR 2.3 SNIP 1.401
Scopus rating (2006): SJR 1.77 SNIP 1.062
Original language: English
DOIs:
10.1021/ct09003417

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Source: researchoutputwizard
Source-ID: 8152
Research output: Scientific - peer-review › Article
Electronic energy harvesting multi BODIPY-zinc porphyrin dyads accommodating fullerene as photosynthetic composite of antenna-reaction center

Exciplex formation and excited state deactivation of difluoroborondipyrromethene (Bodipy) dyads
Excitation transfer in metal-ligand coordinated free-base porphyrin-magnesium phthalocyanine and free-base porphyrin-magnesium naphthalocyanine dyads

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Stranius, K., Jacobs, R., Maligaspe, E., Lemmetyinen, H., Tkachenko, N. V., Zandler, M., D’Souza, F.
Pages: 948-961
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Porphyrins and Phthalocyanines
Volume: 14
Issue number: 11
ISSN (Print): 1088-4246
Ratings:
Scopus rating (2016): SJR 0.354 SNIP 0.379 CiteScore 1.05
Scopus rating (2015): SJR 0.419 SNIP 0.467 CiteScore 1.17
Scopus rating (2014): SJR 0.486 SNIP 0.545 CiteScore 1.39
Scopus rating (2013): SJR 0.537 SNIP 0.602 CiteScore 1.39
Scopus rating (2012): SJR 0.62 SNIP 0.537 CiteScore 1.36
Scopus rating (2011): SJR 0.553 SNIP 0.612 CiteScore 1.4
Scopus rating (2010): SJR 0.564 SNIP 0.46
Scopus rating (2009): SJR 0.511 SNIP 0.447
Scopus rating (2008): SJR 0.572 SNIP 0.481
Good solvent effects of C70 cluster formations and their electron-transporting and photoelectrochemical properties

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Pages: 14287-14297
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry Part B
Volume: 114
Issue number: 45
ISSN (Print): 1520-6106

Ratings:
Scopus rating (2016): CiteScore 3.03 SJR 1.348 SNIP 1.02
Scopus rating (2015): SJR 1.367 SNIP 1.096 CiteScore 3.25
Scopus rating (2014): SJR 1.44 SNIP 1.14 CiteScore 3.28
Scopus rating (2013): SJR 1.494 SNIP 1.2 CiteScore 3.53
Scopus rating (2012): SJR 1.92 SNIP 1.251 CiteScore 3.66
Scopus rating (2011): SJR 1.78 SNIP 1.226 CiteScore 3.62
Scopus rating (2010): SJR 1.849 SNIP 1.214
Scopus rating (2009): SJR 2.232 SNIP 1.349
Scopus rating (2008): SJR 2.543 SNIP 1.381
Scopus rating (2007): SJR 2.346 SNIP 1.282
Scopus rating (2006): SJR 2.369 SNIP 1.415
Scopus rating (2005): SJR 2.275 SNIP 1.474
Scopus rating (2004): SJR 2.148 SNIP 1.511
Scopus rating (2003): SJR 2.034 SNIP 1.47
Scopus rating (2002): SJR 2.118 SNIP 1.496
Scopus rating (2001): SJR 2.053 SNIP 1.508
Scopus rating (2000): SJR 2.145 SNIP 1.527
Scopus rating (1999): SJR 1.713 SNIP 1.8

Original language: English
DOI: 10.1021/jp911141s
Independence and inverted dependence on temperature of rates of photoinduced electron transfer in double-linked phthalocyanine-fullerene dyads

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Lemmetyinen, H., Kumpulainen, T., Niemi, M., Efimov, A., Ranta, J., Stranius, K., Tkachenko, N. V.
Pages: 949-959
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Photochemical & Photobiological Sciences
Volume: 9
Issue number: 7
ISSN (Print): 1474-905X
Ratings:
Scopus rating (2016): SJR 0.722 SNIP 0.799 CiteScore 2.37
Scopus rating (2015): SJR 0.805 SNIP 0.811 CiteScore 2.4
Scopus rating (2014): SJR 0.874 SNIP 0.946 CiteScore 2.55
Scopus rating (2013): SJR 0.989 SNIP 1.006 CiteScore 3
Scopus rating (2012): SJR 1.049 SNIP 0.919 CiteScore 2.73
Scopus rating (2011): SJR 1.013 SNIP 0.962 CiteScore 2.63
Scopus rating (2010): SJR 1.082 SNIP 0.927
Scopus rating (2009): SJR 0.983 SNIP 1.115
Scopus rating (2008): SJR 0.936 SNIP 0.872
Scopus rating (2007): SJR 1.09 SNIP 0.957
Scopus rating (2006): SJR 0.838 SNIP 0.914
Scopus rating (2005): SJR 0.938 SNIP 1.061
Scopus rating (2004): SJR 0.667 SNIP 1.098
Scopus rating (2003): SJR 0.492 SNIP 0.793
Original language: English
DOIs:
10.1039/C0PP00059K

Interlayer energy transfer between perylene diimide and phthalocyanine monolayers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Lehtivuori, H., Kumpulainen, T., Efimov, A., Lemmetyinen, H., Wuerthner, F., Tkachenko, N. V.
Pages: 26-31
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Photochemistry and Photobiology, A: Chemistry
Langmuir-Schaeffer films from a π-π stacking perylenedimide dye: Organization and charge transfer properties

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Tolkki, A., Vuorimaa, E., Chukharev, V., Lemmetyinen, H., Ihalainen, P., Peltonen, J., Dehm, V., Wurstner, F.
Pages: 6630-6637
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Langmuir
Volume: 26
Issue number: 9
ISSN (Print): 0743-7463
Ratings:
Scopus rating (2016): CiteScore 3.99 SJR 1.55 SNIP 1.188
Scopus rating (2015): SJR 1.686 SNIP 1.308 CiteScore 4.33
Scopus rating (2014): SJR 1.816 SNIP 1.391 CiteScore 4.59
Scopus rating (2013): SJR 1.895 SNIP 1.356 CiteScore 4.55
Scopus rating (2012): SJR 2.177 SNIP 1.382 CiteScore 4.37
Scopus rating (2011): SJR 2.051 SNIP 1.357 CiteScore 4.42
Scopus rating (2010): SJR 2.148 SNIP 1.4
Scopus rating (2009): SJR 2.156 SNIP 1.351
Scopus rating (2008): SJR 2.383 SNIP 1.34
Micropolarity and microviscosity of Pluronics L62 and L64 core-shell aggregates in water at various concentrations and additives examined by absorption and fluorescence probes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Vasilescu, M., Bandula, R., Lemmetyinen, H.
Pages: 1173-1184
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Colloid and Polymer Science
Volume: 288
Issue number: 10-11
ISSN (Print): 0303-402X
Ratings:
Scopus rating (2016): SJR 0.575 SNIP 0.627 CiteScore 1.69
Scopus rating (2015): SJR 0.555 SNIP 0.758 CiteScore 1.81
Scopus rating (2014): SJR 0.655 SNIP 0.862 CiteScore 2.01
Scopus rating (2013): SJR 0.772 SNIP 0.948 CiteScore 2.29
Scopus rating (2012): SJR 0.896 SNIP 1.008 CiteScore 2.28
Scopus rating (2011): SJR 0.765 SNIP 1.012 CiteScore 2.2
Scopus rating (2010): SJR 0.942 SNIP 0.913
Scopus rating (2009): SJR 0.957 SNIP 0.863
Scopus rating (2008): SJR 0.803 SNIP 0.776
Scopus rating (2007): SJR 0.893 SNIP 0.774
Scopus rating (2006): SJR 0.702 SNIP 0.712
Scopus rating (2005): SJR 0.713 SNIP 0.821
Scopus rating (2004): SJR 0.623 SNIP 0.836
Scopus rating (2003): SJR 0.82 SNIP 0.927
Scopus rating (2002): SJR 0.871 SNIP 0.94
Scopus rating (2001): SJR 0.951 SNIP 0.92
Scopus rating (2000): SJR 0.915 SNIP 1.031
Scopus rating (1999): SJR 0.943 SNIP 1.15
Original language: English
DOIs:
10.1021/la903978y
10.1007/s00396-010-2247-1
Mono-, bis- and tetrahydroxy phthalocyanines as building blocks for monomolecular layer assemblies

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Sariola, E., Kotiaho, A., Tkachenko, N. V., Lemmetyinen, H., Efimov, A.
Pages: 397-411
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Porphyrins and Phthalocyanines
Volume: 14
Issue number: 5
ISSN (Print): 1088-4246
Ratings:
Scopus rating (2016): SJR 0.354 SNIP 0.379 CiteScore 1.05
Scopus rating (2015): SJR 0.419 SNIP 0.467 CiteScore 1.17
Scopus rating (2014): SJR 0.486 SNIP 0.545 CiteScore 1.39
Scopus rating (2013): SJR 0.537 SNIP 0.602 CiteScore 1.39
Scopus rating (2012): SJR 0.62 SNIP 0.537 CiteScore 1.36
Scopus rating (2011): SJR 0.553 SNIP 0.612 CiteScore 1.4
Scopus rating (2010): SJR 0.564 SNIP 0.46
Scopus rating (2009): SJR 0.511 SNIP 0.447
Scopus rating (2008): SJR 0.572 SNIP 0.481
Scopus rating (2007): SJR 0.669 SNIP 0.481
Scopus rating (2006): SJR 0.625 SNIP 0.529
Scopus rating (2005): SJR 0.632 SNIP 0.593
Scopus rating (2004): SJR 0.646 SNIP 0.667
Scopus rating (2003): SJR 0.591 SNIP 0.88
Scopus rating (2002): SJR 0.86 SNIP 1.153
Scopus rating (2001): SJR 0.796 SNIP 1.08
Scopus rating (2000): SJR 0.863 SNIP 0.759
Scopus rating (1999): SJR 0.557 SNIP 0.635
Original language: English
DOI:
10.1142/S1088424610002185

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Source: researchoutputwizard
Source-ID: 9231
Research output: Scientific - peer-review › Article

Multicomponent molecularly controlled Langmuir-Blodgett systems for organic photovoltaic applications

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Vivo, P., Vuorinen, T., Chukharev, V., Tolkki, A., Kaunisto, K., Ihalainen, P., Peltonen, J., Lemmetyinen, H.
Pages: 8559-8567
Publication date: 2010
Mutagen structure and transcriptional response: Induction of distinct transcriptional profiles in Salmonella TA100 by the drinking-water mutagen MX and its homologues

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Pages: 69-79
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Environmental and Molecular Mutagenesis
Volume: 51
Issue number: 1
ISSN (Print): 0893-6692
Ratings:
Scopus rating (2016): SJR 1.478 SNIP 0.996 CiteScore 3.49
Scopus rating (2015): SJR 1.341 SNIP 0.939 CiteScore 3.01
Scopus rating (2014): SJR 0.948 SNIP 0.831 CiteScore 2.44
Scopus rating (2013): SJR 1.194 SNIP 1.025 CiteScore 3.1
Scopus rating (2012): SJR 1.401 SNIP 1.187 CiteScore 3.46
Scopus rating (2011): SJR 1.426 SNIP 1.208 CiteScore 3.68
Scopus rating (2010): SJR 1 SNIP 1.07
Scopus rating (2009): SJR 0.74 SNIP 0.881
Scopus rating (2008): SJR 0.776 SNIP 1.006
Scopus rating (2007): SJR 1.033 SNIP 1.033
Scopus rating (2006): SJR 0.982 SNIP 0.887
Scopus rating (2005): SJR 0.645 SNIP 0.751
Scopus rating (2004): SJR 0.744 SNIP 0.877
Scopus rating (2003): SJR 0.882 SNIP 0.978
Off the back or on the side: Comparison of meso and 2-substituted donor-acceptor difluoroborondipyrromethene (Bodipy) dyads

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Benniston, A. C., Copley, G., Lemmettyinen, H., Tkachenko, N. V.
Pages: 2867-2877
Publication date: 2010
Peer-reviewed: Yes

Publication information
Volume: 2010
Issue number: 15
ISSN (Print): 1434-193X
Ratings:
Scopus rating (2016): CiteScore 2.74 SJR 1.133 SNIP 0.653
Scopus rating (2015): SJR 1.198 SNIP 0.758 CiteScore 2.88
Scopus rating (2014): SJR 1.181 SNIP 0.767 CiteScore 2.96
Scopus rating (2013): SJR 1.292 SNIP 0.796 CiteScore 2.96
Scopus rating (2012): SJR 1.471 SNIP 0.811 CiteScore 2.93
Scopus rating (2011): SJR 1.536 SNIP 0.857 CiteScore 3.2
Scopus rating (2010): SJR 1.572 SNIP 0.785
Scopus rating (2009): SJR 1.497 SNIP 0.778
Scopus rating (2008): SJR 1.652 SNIP 0.759
Scopus rating (2007): SJR 1.711 SNIP 0.84
Scopus rating (2006): SJR 1.505 SNIP 0.849
Scopus rating (2005): SJR 1.246 SNIP 0.763
Scopus rating (2004): SJR 1.2 SNIP 0.81
Scopus rating (2003): SJR 1.19 SNIP 0.802
Scopus rating (2002): SJR 1.382 SNIP 0.829
Scopus rating (2001): SJR 1.159 SNIP 0.816
Scopus rating (2000): SJR 1.192 SNIP 1.048
Scopus rating (1999): SJR 0.877 SNIP 0.976
Original language: English
DOIs: 10.1002/ejoc.201000215

Bibliographical note
Contribution: organisation=keb kem,FACT1=1
Source: researchoutputwizard
Source-ID: 9628
Research output: Scientific - peer-review » Article
Photoconductivity of thin organic films

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Tkachenko, N. V., Chukharev, V., Kaplas, P., Tolkki, A., Efimov, A., Haring, K., Viheriälä, J., Niemi, T., Lemmetyinen, H.
Pages: 3900-3905
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Applied Surface Science
Volume: 256
Issue number: 12
ISSN (Print): 0169-4332
Ratings:
Scopus rating (2016): CiteScore 3.37 SJR 0.951 SNIP 1.225
Scopus rating (2015): SJR 0.914 SNIP 1.3 CiteScore 3.13
Scopus rating (2014): SJR 0.958 SNIP 1.477 CiteScore 2.96
Scopus rating (2013): SJR 0.965 SNIP 1.488 CiteScore 2.78
Scopus rating (2012): SJR 0.918 SNIP 1.373 CiteScore 2.26
Scopus rating (2011): SJR 0.908 SNIP 1.402 CiteScore 2.27
Scopus rating (2010): SJR 0.924 SNIP 1.141
Scopus rating (2009): SJR 0.842 SNIP 1.023
Scopus rating (2008): SJR 0.899 SNIP 1.087
Scopus rating (2007): SJR 0.795 SNIP 0.945
Scopus rating (2006): SJR 0.852 SNIP 1.052
Scopus rating (2005): SJR 0.679 SNIP 0.946
Scopus rating (2004): SJR 0.964 SNIP 1.126
Scopus rating (2003): SJR 0.988 SNIP 1.027
Scopus rating (2002): SJR 0.921 SNIP 0.954
Scopus rating (2001): SJR 0.841 SNIP 0.796
Scopus rating (2000): SJR 0.866 SNIP 0.772
Scopus rating (1999): SJR 1.064 SNIP 0.907
Original language: English
DOIs:
10.1016/j.apsusc.2010.01.047

Bibliographical note
Contribution: organisation=keb kem,FACT1=0.5
Contribution: organisation=orc,FACT2=0.5
Source: researchoutputwizard
Source-ID: 9409
Research output: Scientific - peer-review › Article

Photodynamics of energy and electron transfers in solid films of porphyrin, phthalocyanine, and perylene dlimide derivatives

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Chemistry and Bioengineering
Authors: Lehtivuori, H.
Publication date: 2010

Publication information
Place of publication: Tampere
Photoinduced charge and energy transfer in phthalocyanine-functionalized gold nanoparticles

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Kotiaho, A., Lahtinen, R., Efimov, A., Metsberg, H., Sariola, E., Lehtivuori, H., Tkachenko, N. V., Lemmetyinen, H.
Pages: 162-168
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 114
Issue number: 1
ISSN (Print): 1932-7447

Ratings:
Scopus rating (2016): CiteScore 4.48 SJR 1.948 SNIP 1.181
Scopus rating (2015): SJR 1.917 SNIP 1.268 CiteScore 4.68
Scopus rating (2014): SJR 2.027 SNIP 1.448 CiteScore 5.08
Scopus rating (2013): SJR 2.134 SNIP 1.439 CiteScore 5.14
Scopus rating (2012): SJR 2.514 SNIP 1.46 CiteScore 4.98
Scopus rating (2011): SJR 2.32 SNIP 1.457 CiteScore 4.92
Scopus rating (2010): SJR 2.438 SNIP 1.356
Scopus rating (2009): SJR 2.128 SNIP 1.417
Scopus rating (2008): SJR 1.856 SNIP 1.033

Original language: English
DOIs: 10.1021/jp9087173

Bibliographical note
Contribution: organisation=keb kem,FACT1=1

Photoinduced electron transfer in thin films of porphyrin-fullerene dyad and perylenetetra-carboxidiimide

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Vivo, P., Alekseev, A. S., Kaunisto, K., Pekkola, O., Tokkki, A., Chukharev, V., Efimov, A., Ihialainen, P., Peltonen, J., Lemmetyinen, H.
Pages: 12525-12532
Publication date: 2010
Photoinduced vectorial electron transfer in multilayered Langmuir-Blodgett films of porphyrin and phtalocyanine derivatives

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Alekseev, A. S., Tkachenko, N. V., Efimov, A. V., Lemmetyinen, H.
Pages: 1230-1241
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Russian Journal of Physical Chemistry A
Volume: 84
Issue number: 7
ISSN (Print): 0036-0244
Ratings:
Scopus rating (2016): SJR 0.288 SNIP 0.615 CiteScore 0.57
Scopus rating (2015): SJR 0.269 SNIP 0.571 CiteScore 0.54
Scopus rating (2014): SJR 0.294 SNIP 0.628 CiteScore 0.56
Scopus rating (2013): SJR 0.322 SNIP 0.677 CiteScore 0.51
Scopus rating (2012): SJR 0.269 SNIP 0.494 CiteScore 0.36
Scopus rating (2011): SJR 0.257 SNIP 0.403 CiteScore 0.3
Preparation of indole-phosphine oxazoline (IndPHOX) ligands and their application in allylic alkylation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering
Authors: Wang, Y., Hämäläinen, A., Tois, J., Franzen, R.
Pages: 2376-2384
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Tetrahedron : Asymmetry
Volume: 21
Issue number: 19
ISSN (Print): 0957-4166
Ratings:
Scopus rating (2016): SJR 0.751 SNIP 0.663 CiteScore 2.05
Scopus rating (2015): SJR 0.777 SNIP 0.713 CiteScore 2.04
Scopus rating (2014): SJR 0.75 SNIP 0.723 CiteScore 2.12
Scopus rating (2013): SJR 0.965 SNIP 0.725 CiteScore 2.24
Scopus rating (2012): SJR 1.037 SNIP 0.748 CiteScore 2.15
Scopus rating (2011): SJR 1.288 SNIP 0.839 CiteScore 2.69
Scopus rating (2010): SJR 1.292 SNIP 0.904
Scopus rating (2009): SJR 1.275 SNIP 0.84
Scopus rating (2008): SJR 1.481 SNIP 0.853
Scopus rating (2007): SJR 1.534 SNIP 0.868
Scopus rating (2006): SJR 1.425 SNIP 0.925
Scopus rating (2005): SJR 1.275 SNIP 0.902
Scopus rating (2004): SJR 1.302 SNIP 0.974
Scopus rating (2003): SJR 1.181 SNIP 0.966
Scopus rating (2002): SJR 1.525 SNIP 0.924
Scopus rating (2001): SJR 1.533 SNIP 1.074
Scopus rating (2000): SJR 1.764 SNIP 1.102
Scopus rating (1999): SJR 1.599 SNIP 1.036
Original language: English
Real-time IR study of ultra-thin film photopolymerization of liquid porphyrin monomer

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Lintinen, K., Granqvist, N., Efimov, A., Lemmetyinen, H.
Pages: 1977-1980
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Macromolecular Rapid Communications
Volume: 31
Issue number: 22
ISSN (Print): 1022-1336
Ratings:
Scopus rating (2016): SJR 1.689 SNIP 0.946 CiteScore 4.19
Scopus rating (2015): SJR 1.795 SNIP 1.069 CiteScore 4.66
Scopus rating (2014): SJR 1.807 SNIP 1.136 CiteScore 4.72
Scopus rating (2013): SJR 1.762 SNIP 1.137 CiteScore 4.78
Scopus rating (2012): SJR 2.09 SNIP 1.239 CiteScore 4.7
Scopus rating (2011): SJR 1.999 SNIP 1.13 CiteScore 4.47
Scopus rating (2010): SJR 2.04 SNIP 1.159
Scopus rating (2009): SJR 2.221 SNIP 1.16
Scopus rating (2008): SJR 2.055 SNIP 1.208
Scopus rating (2007): SJR 2.066 SNIP 1.185
Scopus rating (2006): SJR 1.9 SNIP 1.222
Scopus rating (2005): SJR 1.727 SNIP 1.248
Scopus rating (2004): SJR 2.067 SNIP 1.509
Scopus rating (2003): SJR 2.113 SNIP 1.367
Scopus rating (2002): SJR 2.006 SNIP 1.134
Scopus rating (2001): SJR 1.769 SNIP 1.153
Scopus rating (2000): SJR 1.747 SNIP 1.512
Scopus rating (1999): SJR 1.996 SNIP 1.403
Original language: English
DOIs:
10.1002/marc.201000315

Selective formation and efficient photocurrent generation of [70]fullerene-single-walled carbon nanotube composites

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Self-assembled monolayers (SAMs) of porphyrin deposited inside hollow-core photonic bandgap fiber (HCPBGF)

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Veselov, A., Thur, C., Efimov, A., Guina, M., Lemmetyinen, H., Tkachenko, N.
Pages: 45-45
Publication date: 2010

Host publication information
Title of host publication: Optics Days 2010 Proceedings, May 6-7, 2010, Tampere, Finland
Editor: Reith, C.

Bibliographical note
Contribution: organisation=keb kem,FACT1=0.5
Contribution: organisation=orc,FACT2=0.5
Source: researchoutputwizard
Source-ID: 9551
Research output: Scientific › Conference contribution
Self-assembled monolayers (SAMs) of porphyrin deposited inside hollow-core photonic bandgap fiber (HCPBGF) and polarization maintaining fiber (PMF)

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Veselov, A., Thur, C., Efimov, A., Chamorovskiy, A., Guina, M., Okhotnikov, O. G., Lemmetyinen, H., Tkachenko, N.
Pages: 2 p
Publication date: 2010

Host publication information
Title of host publication: Optical Sensors, June 21, 2010, Karlsruhe, Germany
Publisher: OSA Optical Society of America

Bibliographical note
Contribution: organisation=keb kem,FACT1=0.5<br/>Contribution: organisation=orc,FACT2=0.5
Source: researchoutputwizard
Source-ID: 9549
Research output: Scientific - peer-review › Conference contribution

Synthesis and characterization of monoisomeric 1,8,15,22-substituted (A3B and A2B2) phthalocyanines and phthalocyanine-fullerene dyads

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Ranta, J., Kumpulainen, T., Lemmetyinen, H., Efimov, A.
Pages: 5178-5194
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Organic Chemistry
Volume: 75
Issue number: 15
ISSN (Print): 0022-3263
Ratings:
Scopus rating (2016): CiteScore 4.59 SJR 1.976 SNIP 1.03
Scopus rating (2015): SJR 2.018 SNIP 1.174 CiteScore 4.69
Scopus rating (2014): SJR 2.003 SNIP 1.222 CiteScore 4.69
Scopus rating (2013): SJR 2.078 SNIP 1.176 CiteScore 4.51
Scopus rating (2012): SJR 2.272 SNIP 1.23 CiteScore 4.31
Scopus rating (2011): SJR 2.27 SNIP 1.261 CiteScore 4.43
Scopus rating (2010): SJR 2.112 SNIP 1.173
Scopus rating (2009): SJR 2.186 SNIP 1.254
Scopus rating (2008): SJR 2.309 SNIP 1.208
Scopus rating (2007): SJR 2.37 SNIP 1.309
Scopus rating (2006): SJR 2.222 SNIP 1.31
Scopus rating (2005): SJR 1.995 SNIP 1.3
Scopus rating (2004): SJR 1.945 SNIP 1.315
Scopus rating (2003): SJR 1.865 SNIP 1.355
Scopus rating (2002): SJR 2.319 SNIP 1.441
Scopus rating (2001): SJR 2.064 SNIP 1.406
Scopus rating (2000): SJR 2.172 SNIP 1.403
Scopus rating (1999): SJR 2.013 SNIP 1.402
Synthesis and time-resolved fluorescence study of porphyrin-functionalized gold nanoparticles

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Kotiaho, A., Lahtinen, R., Efimov, A., Lehtivuori, H., Tkachenko, N. V., Kanerva, T., Lemmetyinen, H.
Pages: 129-134
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Photochemistry and Photobiology, A: Chemistry
Volume: 212
Issue number: 2-3
ISSN (Print): 1010-6030
Ratings:
Scopus rating (2016): SJR 0.732 SNIP 0.841 CiteScore 2.6
Scopus rating (2015): SJR 0.72 SNIP 0.86 CiteScore 2.47
Scopus rating (2014): SJR 0.782 SNIP 0.97 CiteScore 2.39
Scopus rating (2013): SJR 0.818 SNIP 1.006 CiteScore 2.5
Scopus rating (2012): SJR 0.919 SNIP 1.116 CiteScore 2.51
Scopus rating (2011): SJR 0.97 SNIP 1.342 CiteScore 2.84
Scopus rating (2010): SJR 1.021 SNIP 1.05
Scopus rating (2009): SJR 1.163 SNIP 1.191
Scopus rating (2008): SJR 1.04 SNIP 1.137
Scopus rating (2007): SJR 1.175 SNIP 1.364
Scopus rating (2006): SJR 0.996 SNIP 1.263
Scopus rating (2005): SJR 1.102 SNIP 1.436
Scopus rating (2004): SJR 0.952 SNIP 1.213
Scopus rating (2003): SJR 0.76 SNIP 0.987
Scopus rating (2002): SJR 0.646 SNIP 0.864
Scopus rating (2001): SJR 0.572 SNIP 0.934
Scopus rating (2000): SJR 0.782 SNIP 0.945
Scopus rating (1999): SJR 0.666 SNIP 1.047
Original language: English
DOIs:
10.1016/j.jphotochem.2010.04.005

Synthesis of chiral unsaturated aminolactones using Pd-catalyzed allylic amination

General information
State: Published
Ultrafast singlet-singlet energy transfer in self-assembled via metal-ligand axial coordination of free-base porphyrin-zinc phthalocyanine and free-base porphyrin-zinc naphthalocyanine dyads

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Authors: Maligaspe, E., Kumpulainen, T., Lemmetyinen, H., Tkachenko, N. V., Subbaiyan, N., Zandler, M. E., D'Souza, F.
Pages: 268-277
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry A
Volume: 114
Issue number: 1
ISSN (Print): 1089-5639
Ratings:
Scopus rating (2016): SJR 1.258 SNIP 0.98 CiteScore 2.64
Unambiguous probe of surface chirality based on focused circularly-polarized light

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: Nonlinear Optics, Research area: Optics, Department of Chemistry and Bioengineering, Department of Physics, Research group: Supramolecular photochemistry
Authors: Huttunen, M., Virkki, M., Erkintalo, M., Kauranen, M., Vuorimaa, E., Efimov, A., Lemmetyinen, H.
Pages: 2 p
Publication date: 2010

Host publication information
Title of host publication: Conference on Lasers and Electro-Optics (CLEO) and the Quantum Electronics and Laser Science Conference (QELS) Citation Information, 16.-21.5.2010, San Jose, California, USA
Place of publication: Washington, DC
Publisher: OSA

Bibliographical note
Contribution: organisation=fys,FACT1=0.5
Contribution: organisation=keb kem,FACT2=0.5
Source: researchoutputwizard
Source-ID: 8128
Research output: Scientific - peer-review › Conference contribution

Unambiguous probe of surface chirality based on focused circular polarizations

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Research group: Nonlinear Optics, Research area: Optics, Department of Chemistry and Bioengineering, Department of Physics, Research group: Supramolecular photochemistry
Authors: Huttunen, M. J., Virkki, M., Erkintalo, M., Vuorimaa, E., Efimov, A., Lemmetyinen, H., Kauranen, M.
Pages: 32
Publication date: 2010
Vectorial photoinduced electron transfer in multicomponent film systems of poly(3-hexylthiophene), porphyrin-fullerene dyad, and perylenetetracarboxdiimide

Z-Selective synthesis of o-bromoacetophenone N-tosylhydrazones and formation of 3-methylindazoles in aqueous ethanol
Cyclization of Diazoacetamides Catalyzed by N-Heterocyclic Carbene Dirhodium(II) Complexes

The axial coordination of N-heterocyclic carbene ligands onto dirhodium(II) complexes was examined, together with its role in the intramolecular C-H insertion reactions of alpha-diazoacetamides. The formation of a decarbonylated product occurs by a free-carbene mechanism in which the structures of the catalyst and the acetamide play a decisive role.
More Sustainable Approaches for the Synthesis of N-Based Heterocycles

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Candeias, N. R., Branco, L. C., Gois, P. M. P., Afonso, C. A. M., Trindade, A. F.
Number of pages: 100
Pages: 2703-2802
Publication date: Jun 2009
Peer-reviewed: Yes

Publication information
Journal: Chemical Reviews
Volume: 109
Issue number: 6
ISSN (Print): 0009-2665
Ratings:

Scopus rating (2016): SJR 19.282 SNIP 10.369 CiteScore 42.79
Scopus rating (2015): SJR 18.373 SNIP 11.51 CiteScore 45.92
Scopus rating (2014): SJR 18.369 SNIP 11.47 CiteScore 44.56
Scopus rating (2013): SJR 22.176 SNIP 12.915 CiteScore 49.12
Scopus rating (2012): SJR 20.511 SNIP 11.43 CiteScore 39.08
Scopus rating (2011): SJR 19.538 SNIP 11.534 CiteScore 39.19
Scopus rating (2010): SJR 18.393 SNIP 11.114
Scopus rating (2008): SJR 16.038 SNIP 8.682
Developments in the Photochemistry of Diazo Compounds

This review focuses on photolytic reactions of diazo compounds, namely aryl-diazo alkanes and alpha-diazo carbonyl compounds, covering their synthetic applications such as Wolff rearrangement, 1,2-shift, X-H insertion, cyclopropanation, hydrogen abstraction and reaction with oxygen as well as physical organic studies, with special relevance to mechanistic considerations. Singlet-triplet gap studies and the solvent influence on the stability and reactivity of carbenes are also covered together in this review to provide a comprehensive interpretation of their reactivity. The mechanism of the synthetically important Wolff rearrangement, which remains to this day open to discussion, is evaluated in terms of the role of the diazo framework. 1,2-Shift photoinduced reactions, on the other hand, present well established mechanisms due to recent studies that have demonstrated the importance of photoexcited diazo species. The cyclopropanation reaction mechanism, which is used to demonstrate the spin multiplicity nature of a free carbene, is also well established. Contrary to these latter cases, O-H insertion and C-H insertion reactions continue to lack defined mechanisms inspite of recent studies. The few examples of diazo compounds reactions with molecular oxygen and hydrogen abstraction present in the literature are also covered.
Water: A Suitable Medium for the Petasis Borono-Mannich Reaction

Water was used as the solvent in the Petasis borono-Mannich reaction. With the use of salicylaldehyde, secondary amines and boronic acids, several alkylaminophenols were obtained in considerably high yields in water. By using the same methodology, 2H-chromenes were prepared with the use of vinyl boronic acids. The reaction mechanism was studied by DFT calculations, and the results obtained corroborate the solvent effect experimentally observed. ((C) Wiley-VCH Verlag GmbH & Co. KGaA, 69451 Weinheim, Germany, 2009)

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Univ Lisbon, Universidade de Lisboa, Fac Farm, iMed UL, Univ Tecn Lisboa, Instituto Superior Tecnico, Universidade de Lisboa, Inst Nanosci & Nanotechnol, Ctr Quim Fis Mol & IN, Inst Super Tecn, Inst Super Tecn, Instituto Superior Tecnico, Universidade de Lisboa, Dept Engn Quim & Biol, Ctr Quim Estrutural
Authors: Candeias, N. R., Veiros, L. F., Afonso, C. A. M., Gois, P. M. P.
Number of pages: 5
Pages: 1859-1863
Publication date: Apr 2009
Peer-reviewed: Yes

Publication information
Issue number: 12
ISSN (Print): 1434-193X
Ratings:
Scopus rating (2016): CiteScore 2.74 SJR 1.133 SNIP 0.653
Scopus rating (2015): SJR 1.198 SNIP 0.758 CiteScore 2.88
Scopus rating (2014): SJR 1.181 SNIP 0.767 CiteScore 2.96
Scopus rating (2013): SJR 1.292 SNIP 0.796 CiteScore 2.96
Scopus rating (2012): SJR 1.471 SNIP 0.811 CiteScore 2.93
Scopus rating (2011): SJR 1.536 SNIP 0.857 CiteScore 3.2
Scopus rating (2010): SJR 1.572 SNIP 0.785
Scopus rating (2009): SJR 1.497 SNIP 0.778
Scopus rating (2008): SJR 1.652 SNIP 0.759
Scopus rating (2007): SJR 1.711 SNIP 0.84
Scopus rating (2006): SJR 1.505 SNIP 0.849
Scopus rating (2005): SJR 1.246 SNIP 0.763
Scopus rating (2004): SJR 1.2 SNIP 0.81
Scopus rating (2003): SJR 1.19 SNIP 0.802
Scopus rating (2002): SJR 1.382 SNIP 0.829
Scopus rating (2001): SJR 1.159 SNIP 0.816
Intramolecular C-H insertion using NHC-di-rhodium(II) complexes the influence of axial coordination

In this work we show that the intramolecular C-H insertion of diazo-acetamides catalysed by di-rhodium(II) complexes can be highly influenced by the axial ligand on the di-rhodium(II) complex. Axially monocoordinated NHC-Rh(2)(OAc)(4) complexes have a distinct reactivity from the parent Rh(2)(OAc)(4) complex affording the cyclisation products in different rates and selectivities. Surprisingly, a new reaction mode emerged when using these complexes which led to a decarbonylation pathway. (C) 2008 Elsevier Ltd. All rights reserved.
C-H carbene insertion of alpha-diazo acetamides by photolysis in non-conventional media

Light from a mercury vapor high-pressure lamp was used to induce the photolytic decomposition of alpha-diazo acetamides in hexane and in nonconventional media such as water or a film. The corresponding beta- and/or gamma-lactams were obtained in reasonable yields and in some cases with good diastereoselectivities with no need to use a metallic catalyst. Experimental studies on chiral substrates demonstrated the occurrence of insertion with retention of configuration.
Efficient catalyst reuse by simple dissolution in non-conventional media

This feature article is a description of the achievements made on the development of attractive sustainable approaches to synthetic organic chemistry, namely, catalyst reuse by simple dissolution in water and ionic liquids and asymmetric transformations induced by readily available chiral ionic liquids.
Rhodium (ii) carbene C-H insertion in water and catalyst reuse

A five-session laboratory experiment is described for the synthesis of a P-lactam via Rh(II) catalysed intramolecular C-H insertion of a alpha-diazo-alpha-ethoxycarbonylacetamide. The metallo-carbene, responsible for the C-H bond activation, was generated from the diazo substrate and the catalyst Rh-2(OAc)(4). The high stability and solubility of the catalyst and the exclusive C-H insertion of the Rh-carbene allows the synthesis of this important heterocycle in water and the catalyst reutilization.
Rh(II)-catalyzed intramolecular C-H insertion of diazo substrates in water: Scope and limitations

Preferential Rh(II) carbenoid intramolecular C-H versus O-H insertion derived from R-diazo-acetamides can be achieved in water by using an appropriate combination of the catalyst and amide groups, which creates a larger hydrophobic environment around the reactive carbenoid center.

Optical Spectroscopy: Methods and Instrumentations

General information
State: Published
Ministry of Education publication type: C1 Separate scientific books
Organisations: Materiaalioppi, Kemia
Authors: Tkachenko, N. V.
Number of pages: 307
Preparation of non-fused heterocycles in zeolites and mesoporous materials

The use of zeolites and mesoporous materials in synthesis and industrial applications are extremely important due to their acidity properties and their reuse facility. In this review, is presented the use of zeolites and mesoporous materials in the preparation of non-fused heterocycles compounds, with particular emphasis in epoxidations, aziridinations and the Beckmann's rearrangement. (c) 2005 Elsevier B.V. All rights reserved.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Universidade de Lisboa
Authors: Candeias, N., Afonso, C.
Number of pages: 23
Pages: 195-217
Publication date: 1 Dec 2005
Peer-reviewed: Yes

Publication information
Journal: Journal of Molecular Catalysis A: Chemical
Volume: 242
Issue number: 1-2
ISSN (Print): 1381-1169
Ratings:
Scopus rating (2016): SJR 1.006 SNIP 1.095 CiteScore 3.96
Scopus rating (2015): SJR 1.052 SNIP 1.262 CiteScore 3.93
Scopus rating (2014): SJR 1.092 SNIP 1.431 CiteScore 3.93
Scopus rating (2013): SJR 1.155 SNIP 1.315 CiteScore 3.56
Scopus rating (2012): SJR 1.257 SNIP 1.363 CiteScore 3.25
Scopus rating (2011): SJR 1.242 SNIP 1.252 CiteScore 3.14
Scopus rating (2010): SJR 1.248 SNIP 1.342
Scopus rating (2009): SJR 1.321 SNIP 1.425
Scopus rating (2008): SJR 1.259 SNIP 1.232
Scopus rating (2007): SJR 1.316 SNIP 1.206
Scopus rating (2006): SJR 1.118 SNIP 1.076
Scopus rating (2005): SJR 1.269 SNIP 1.117
Scopus rating (2004): SJR 1.125 SNIP 1.291
Scopus rating (2003): SJR 1.061 SNIP 1.236
Scopus rating (2002): SJR 1.067 SNIP 1.005
Scopus rating (2001): SJR 0.954 SNIP 0.883
Scopus rating (2000): SJR 1.106 SNIP 1.117
Scopus rating (1999): SJR 1.19 SNIP 1.225
Original language: English
Keywords: zeolites, mesoporous materials, epoxidation, aziridination, Beckmann rearrangement, epsilon-caprolactam, catalyst reuse, immobilization, solid support, asymmetric catalyst, PHASE BECKMANN REARRANGEMENT, ASYMMETRIC HETEROGENEOUS AZIRIDINATION, CHIRAL ALLYLIC ALCOHOLS, H-BETA CATALYST, CYCLOHEXANONE-OXIME, EPSILON-CAPROLACTAM, HYDROGEN-PEROXIDE, MOLECULAR-SIEVES, ACTIVE-SITES, TITANIUM SILICALITE
Preparation of enantioselective enriched alpha-(dialkoxyphosphoryl) lactams via intramolecular C-H insertion with chiral dirhodium(II) catalysts

The intramolecular C-H insertion on alpha-diazoacetamides is an extremely useful procedure for the preparation of a wide variety of heterocyclic compounds. In this work is presented a strategy for the preparation of enantioselective enriched alpha-(dialkoxyphosphoryl) lactams via dirhodium(II) catalyzed C-H insertion on alpha-diazo-alpha-(dialkoxyphosphoryl) acetamides, in which enantiomeric excess up to 40% is reported. Moreover, a systematic study was undertaken on the chiral dirhodium(II) catalyst and the alpha-diazo-alpha-(dialkoxyphosphoryl)acetamides influence on enantioselectivity. (C) 2004 Elsevier B.V. All rights reserved.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Univ Nova Lisboa, Universidade Nova de Lisboa, REQUIMTE, Dept Quim, Fac Ciencias & Tecnol
Authors: Gois, P. M. P., Candeias, N. R., Afonso, C. A. M.
Number of pages: 8
Pages: 17-24
Publication date: 1 Mar 2005
Peer-reviewed: Yes

Publication information
Journal: Journal of Molecular Catalysis A: Chemical
Volume: 227
Issue number: 1-2
ISSN (Print): 1381-1169
Ratings:
Scopus rating (2016): SJR 1.006 SNIP 1.095 CiteScore 3.96
Scopus rating (2015): SJR 1.052 SNIP 1.262 CiteScore 3.93
Scopus rating (2014): SJR 1.092 SNIP 1.431 CiteScore 3.93
Scopus rating (2013): SJR 1.155 SNIP 1.315 CiteScore 3.56
Scopus rating (2012): SJR 1.257 SNIP 1.363 CiteScore 3.25
Scopus rating (2011): SJR 1.242 SNIP 1.252 CiteScore 3.14
Scopus rating (2010): SJR 1.248 SNIP 1.342
Scopus rating (2009): SJR 1.321 SNIP 1.425
Scopus rating (2008): SJR 1.259 SNIP 1.232
Scopus rating (2007): SJR 1.316 SNIP 1.206
Scopus rating (2006): SJR 1.118 SNIP 1.076
Scopus rating (2005): SJR 1.269 SNIP 1.117
Scopus rating (2004): SJR 1.125 SNIP 1.291
Scopus rating (2003): SJR 1.061 SNIP 1.236
Scopus rating (2002): SJR 1.067 SNIP 1.005
Scopus rating (2001): SJR 0.954 SNIP 0.883
Scopus rating (2000): SJR 1.106 SNIP 1.117
Scopus rating (1999): SJR 1.19 SNIP 1.225
Original language: English
Keywords: phosphonates, diazo compounds, rhodium catalysts, C-H insertion, lactams, ALPHA-DIAZOACETAMIDES, STEREOCONTROL, REGIOCONTROL

Growth-temperature-dependent bandgap of MBE-grown GaInNAs epilayers lattice matched to GaAs
Rh(II) catalysed intramolecular C-H insertion of diazo substrates in water: a simple and efficient approach to catalyst reuse

Water is an efficient solvent for the Rh(II)/(OAc){4} catalysed intramolecular C–H insertion of a range of diazo substrates without competitive water insertion. Due to the high solubility and stability of the catalyst in water, the catalyst can be efficiently reused.
Comparison of the total mercury content in sediment samples with a mercury sensor bacteria test and Vibrio fischeri toxicity test

The suitability of a luminescent bacterial sensor strain Escherichia coli MC1061(pTOO11) [Virta, M.; Lampinen, J.; Karp, M. Anal Chem 1995, 67, 667-669] for the measuring of mercury from sediment samples was evaluated. The sensor strain is based on the control of expression of a reporter gene, firefly luciferase, by a mercury sensitive regulation unit. The sensor responds to mercury by increased luminescence as a consequence of increased production of the reporter protein luciferase. The method is simple to perform since the luminescence is recorded with a portable luminometer and the sensor bacteria are freeze-dried. The results obtained from river sediment samples were compared with the total mercury content of the samples, which was measured by atomic absorption spectrometry and Leco(R) Mercury analyzer and the modified photobacteria luminescence inhibition test (Lappalainen, J.; Juvonen, R.; Vaajasaari, K.; Karp, M. Chemosphere 1999, 38, 1069-1083). The correlation between the bacterial sensor results with the total mercury content, ranging from 0.01 mg/kg to 16 mg/kg, was significant with 32 samples tested (R-2 UP to 0.8115). There was no correlation between the total mercury content and toxicity measured with Vibrio fischeri in this sample panel, (C) 2000 by John Wiley & Sons, Inc.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: University of Turku
Authors: Lappalainen, J. O., Karp, M. T., Juvonen, R., Virta, M. P. J., Nurmi, J.
Number of pages: 6
Pages: 443-448
Publication date: Dec 2000
Peer-reviewed: Yes

Publication information
Journal: Environmental Toxicology
Volume: 15
Issue number: 5
ISSN (Print): 1520-4081
Ratings:
Scopus rating (2016): SJR 0.688 SNIP 0.829 CiteScore 2.2
Scopus rating (2015): SJR 0.804 SNIP 0.848 CiteScore 2.26
Scopus rating (2014): SJR 0.748 SNIP 0.98 CiteScore 2.16
Scopus rating (2013): SJR 0.767 SNIP 0.897 CiteScore 1.97
Scopus rating (2012): SJR 0.828 SNIP 0.94 CiteScore 2.16
Scopus rating (2011): SJR 0.765 SNIP 0.807 CiteScore 1.98
Scopus rating (2010): SJR 0.762 SNIP 0.795
Scopus rating (2009): SJR 0.683 SNIP 0.868
Scopus rating (2008): SJR 0.784 SNIP 1.021
Scopus rating (2007): SJR 0.766 SNIP 0.963
Scopus rating (2006): SJR 0.847 SNIP 0.837
Scopus rating (2005): SJR 0.574 SNIP 0.722
Scopus rating (2004): SJR 0.584 SNIP 0.836
Scopus rating (2003): SJR 0.612 SNIP 0.783
Scopus rating (2002): SJR 0.638 SNIP 0.772
Scopus rating (2001): SJR 0.564 SNIP 0.764
Scopus rating (2000): SJR 0.619 SNIP 1.135
Scopus rating (1999): SJR 0.658 SNIP 0.823
Original language: English
Keywords: heavy metal, biosensor, mercury, sediment, REPORTER, ARSENITE, ENVIRONMENT, ANTIMONITE, BIOSENSOR, STRAIN
DOIs:
Detecting bioavailable toxic metals and metalloids from natural water samples using luminescent sensor bacteria

We have generated microbial sensors for analyzing the presence of various metals or metalloids by recombinant DNA technology. The strains are based on strictly regulated promoters controlling the expression of the firefly luciferase gene in microbial cells. The regulator-reporter constructs are located in shuttle plasmids capable of replicating in gram-negative or gram-positive microbial organisms. The sensors developed are real-time indicators of metal responsive gene expression giving results in approximately 30 min, with optimal induction times ranging from 60 to 240 min. We describe here the performance of these metal sensing bacteria for the assessment of different water samples spiked with lead, arsenic, mercury or cadmium. We show that these bacteria are sensitive detectors of metal bioavailability, which is difficult or even impossible to measure by traditional analytical chemistry methods. All measurements were done using freeze-dried bacteria, which makes these sensors reagent-like and also easy to use in field conditions. (C) 2000 Elsevier Science Ltd. All rights reserved.

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A recombinant Escherichia coli sensor strain for the detection of tetracyclines

A bioluminescent Escherichia coli K-12 strain for the specific detection of the tetracycline group of antibiotics is described. A sensor plasmid, containing five genes from bacterial luciferase operon of Photorhabdus luminescens inserted under the control of tetracycline-responsive elements of the transposon Tn10, was constructed. Usage of the full-length luciferase operon in the sensor resulted in tetracycline-dependent light production without additions, i.e., self-luminescent phenotype, since all the substrates were intrinsically produced by the recombinant organism. The time needed for optimal induction of light emission was 90 min. Maximal induction of similar to 100-fold over uninduced levels by using 20 ng of tetracycline, and picomole sensitivities for the seven different tetracyclines tested, were obtained without added Mg2+ ions. The higher the pH and the magnesium ion concentration in the assay medium the higher was the amount of membrane-impermeable tetracycline-Mg2+ chelate complex. In consequence, by adjusting the pH and the Mg2+ ion concentration, the sensitivity of the assay can be modified for different analytical purposes. Different non-tetracycline antibiotics did not cause induction of light emission.

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Scopus rating (2010): SJR 2.375 SNIP 1.607
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Scopus rating (2005): SJR 2.497 SNIP 2.016
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Scopus rating (2003): SJR 2.331 SNIP 1.837
Scopus rating (2002): SJR 2.295 SNIP 1.796
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Simultaneous extraction and combined bioluminescent assay of oxidized and reduced nicotinamide adenine dinucleotide

General information
Bioluminescent assay of lactate dehydrogenase and its isoenzyme-1 activity

A bioluminescent assay based on the bacterial luciferase reaction has been developed for the determination of total lactate dehydrogenase and heart-specific lactate dehydrogenase isoenzyme-1 activity in serum. The lactate dehydrogenase-catalyzed reaction was measured in both directions, but NADH formation (lactate----pyruvate) is recommended because it allows the use of optimal reaction conditions. Internal calibration with a known amount of NADH accounts for possible interference from samples when both NADH formation and consumption are followed. The bioluminescent method is sensitive, has good precision, and is readily automated. Serum lactate dehydrogenase isoenzyme-1 was immunochemically isolated and the activity was assayed by bioluminescence. A good correlation between the bioluminescent assays and the conventional spectrophotometric procedure used as reference was obtained.
Fractionation of DNA with Sephacryl S-1000(R)
In this study the application of gel filtration for purification of heterogeneous DNA is described. The fractionation of partial restriction enzyme digests of bacterial chromosomal DNA on a Sephacryl S-1000-column is easy and rapid. Simultaneously intact chromosomal DNA and low molecular weight substances are eliminated in the run. The method is also applicable to the purification of plasmid DNA, as has been previously reported (3). Thus we are able to get pure DNA with yields over 80%.

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Time-resolved europium fluorescence in enzyme activity measurements: a sensitive protease assay
A method for incorporating into proteins a nonradioactive Eu3+ label, which exhibits fluorescence of a long decay time in the presence of suitable ligands, is described. As an example of the use of this label the method has been developed to work as a sensitive protease assay. By hydrolyzing the Eu3+-labeled casein, bound to an insoluble matrix (Sepharose 4B or Affi-Gel 10), with proteases and measuring the Eu3+ released with a pulsed time-resolved fluorometer it was possible to detect as low as 2.5, 1.0, or 1.0 ng of alpha-chymotrypsin, trypsin, or subtilisin, respectively.

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Simultaneous extraction and combined bioluminescent assay of NAD+ and NADH
A new method for extracting pyridine nucleotides from tissue samples at room temperature that allows the simultaneous extraction of both the oxidized and reduced nucleotide when using a 70% buffered ethanol solution as the extractant has been developed. The extraction efficiencies for NAD+ and NADH were 91 and 102%, respectively. The extraction method was followed by a combined bioluminescent assay of both nucleotides. A bacterial bioluminescent system, which included luciferase and low levels of a NADH-specific oxidoreductase, was used to produce a constant light intensity directly proportional to the amount of NADH in the tissue extract sample. When the NADH had been measured, the NAD+ present in the extract was enzymatically converted to NADH by the addition of alcohol dehydrogenase, after which the second increase in light level was recorded. The sensitivity of the bioluminescent assay presented here is 5 X 10(-14) mol NADH or NAD+ per assay.