FinEstBeaMS: A wide-range Finnish-Estonian Beamline for Materials Science at the 1.5 GeV storage ring at the MAX IV Laboratory

The FinEstBeaMS beamline is under construction at the 1.5 GeV storage ring of the MAX IV Laboratory at Lund, Sweden. It has been designed to cover an unusually wide energy range from ultraviolet (4.3 eV) to soft X-rays (1000 eV) but experiment will also be possible at the Mg and Al Ka energies. Instead of having two insertion devices and a different optical scheme for low and high photon energy regions, we have based our design on a single long-period, elliptically polarizing undulator and a plane grating monochromator. This solution will provide very good conditions for planned experiments in the whole photon energy region. The beamline will have two branches: one will be used to investigate free atoms, molecules and clusters with photoelectron/photoion coincidence spectroscopy as well as solids with photoluminescence spectroscopy whereas the other one will be dedicated to ultra-high vacuum studies of surfaces and interphases, utilizing X-ray photoelectron spectroscopy and X-ray absorption spectroscopy. This paper focuses on the optical design of the beamline and general design concepts of the gasphase and solid-state end stations.
31% European InGaP/GaAs/InGaNAs Solar Cells For Space Application

We report a triple junction InGaP/GaAs/InGaNAs solar cell with efficiency of ~31% at AM0, 25 °C fabricated using a combined molecular beam epitaxy (MBE) and metal-organic chemical vapour deposition (MOCVD) processes. The prototype cells comprise of InGaNAs (Indium Gallium Nitride Arsenide) bottom junction grown on a GaAs (Gallium Arsenide) substrate by MBE and middle and top junctions deposited by MOCVD. Repeatable cell characteristics and uniform efficiency pattern over 4-inch wafers were obtained. Combining the advantages offered by MBE and MOCVD opens a new perspective for fabrication of high-efficiency space tandem solar cells with three or more junctions. Results of radiation resistance of the sub-cells are also presented and critically evaluated to achieve high efficiency in EOL conditions.

General information
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Ministry of Education publication type: A4 Article in a conference publication
Organisations: Photonics, Research group: ORC
Authors: Campesato, R., Tukiainen, A., Aho, A., Gori, G., Isoaho, R., Greco, E., Guina, M.
Publication date: 2017

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Research output: Scientific - peer-review » Conference contribution

Improved corrosion properties of Hot Dip Galvanized Steel by nanomolecular silane layers as hybrid interface between zinc and top coatings

Thin organic coatings (TOC) or paints on hot dip galvanized steel (HDGS) improve the corrosion properties and create visually pleasing surfaces. Delamination of these coatings lead to corrosion and peeling of the paints. Hence, a novel method for improved adhesion and corrosion properties for HDGS surfaces is introduced. It is shown how the fabrication of a nanomolecular silane film as an interfacial layer between the HDGS and TOC or paint improves the corrosion properties of HDGS in different pH regimes. Understanding the corrosion behavior of ultra-thin silane layers under differing pH is crucial as subsequent coatings have different pHs. By varying the silanization parameters two different nanomolecular surface structures of aminopropyl trimethoxysilane (APS) on HDGS were fabricated: well-ordered monolayers with approximately 1 nm thickness and highly clustered APS films with a thickness in the range of 5-8 nm. To verify the nanomolecular APS structures, photoelectron spectroscopy (PES) and contact angle (CA) measurements were employed. The corrosion properties of HDGS and silanized HDGS were studied with linear sweep voltammetry (LSV) and electrochemical impedance spectroscopy (EIS). It is shown that at pH 5 and 7 passivation behavior is observed on silanized samples but the most significant improvement in corrosion resistance is found at pH 10 where the corrosion currents of silanized samples are up to two orders of magnitude lower than on uncoated metallic samples. Also, it is
demonstrated that the corrosion inhibition of APS is not only dependent on the thickness of the silane film, but also the molecular ordering at the surface. The thin, well-ordered APS monolayer is more resistant towards corrosion in NaCl solution (pH 7) than thicker clustered APS layer. This indicates that the highly ordered nanomolecular surface structure protects the HDGS-silane interface from the Cl- adsorption better than the thicker, but more randomly ordered APS layers. Nanomolecular interfacial silane films for enhanced corrosion and adhesion properties on HDGS are transferrable to industrial production lines providing a low cost and environmentally friendly method for improved HDGS products.
Further efficiency improvement, up to 32%, is projected by better current balancing and structural optimization.

Elastic-Plastic Transition in MBE-Grown GaSb Semiconducting Crystal Examined by Nanoindentation

General information
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Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Univ Helsinki, University of Helsinki, Dept Phys, Aalto University, Department of Materials Science and Engineering, Institute of Materials Science, University of Silesia, 75 Pułku Piechoty 1, 45-500 Chorzów, Poland, Institute of Physics, University of Silesia, 75 Pułku Piechoty 1, 45-500 Chorzów, Poland
Authors: Majtyka, A., Trębala, M., Tukiainen, A., Chrobak, D., Borgieł, W., Räisänen, J., Nowak, R.
Number of pages: 3
Pages: 1131-1133
Publication date: 1 Oct 2016
Peer-reviewed: Yes

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Scopus rating (2016): 0.235 0.411
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Scopus rating (2015): 0.267 0.493
Web of Science (2015): 0.525 0.54 4.6 0.111 0.00516 0.113
Publication Forum (2015): 1
Scopus rating (2014): 0.276 0.614
Web of Science (2014): 0.53 0.497 4.3 0.068 0.00523 0.118
Publication Forum (2014): 1
Scopus rating (2013): 0.345 0.556
Publication Forum (2013): 1
Scopus rating (2012): 0.287 0.575
Publication Forum (2012): 1
Scopus rating (2011): 0.254 0.471
Improved antifouling properties and selective biofunctionalization of stainless steel by employing heterobifunctional silane-polyethylene glycol overlayers and avidin-biotin technology

A straightforward solution-based method to modify the biofunctionality of stainless steel (SS) using heterobifunctional silane-polyethylene glycol (silane-PEG) overlayers is reported. Reduced nonspecific biofouling of both proteins and bacteria onto SS and further selective biofunctionalization of the modified surface were achieved. According to photoelectron spectroscopy analyses, the silane-PEGs formed less than 10 Å thick overlayers with close to 90% surface coverage and reproducible chemical compositions. Consequently, the surfaces also became more hydrophilic, and the observed non-specific biofouling of proteins was reduced by approximately 70%. In addition, the attachment of E. coli was reduced by more than 65%. Moreover, the potential of the overlayer to be further modified was demonstrated by successfully coupling biotinylated alkaline phosphatase (bAP) to a silane-PEG-biotin overlayer via avidin-biotin bridges. The activity of the immobilized enzyme was shown to be well preserved without compromising the achieved antifouling properties. Overall, the simple solution-based approach enables the tailoring of SS to enhance its activity for biomedical and biotechnological applications.

General information
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Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, BioMediTech, University of Jyväskylä, Department of Physics, NanoScience Center
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Publication Forum (2016): 2
Scopus rating (2015): 2.057 1.684
Web of Science (2015): 5.228 5.525 2.1 0.559 0.20942 1.865
Publication Forum (2015): 2
Scopus rating (2014): 2.103 1.544
Web of Science (2014): 5.578 5.597 1.7 0.722 0.11476 2.075
Publication Forum (2014): 1
Scopus rating (2013): 1.886 1.51
We present a widely scalable, high temperature post-growth annealing method for converting ultra-thin films of TiO2 grown by atomic layer deposition to topographically microstructured titanium silicide (TiSi). The photoemission electron microscopy results reveal that the transformation from TiO2 to TiSi at 950 °C proceeds via island formation. Inside the islands, TiO2 reduction and Si diffusion play important roles in the formation of the highly topographically microstructured TiSi interface with laterally nonuniform barrier height contact. This is advantageous for efficient charge transfer in Si-based heterostructures for photovoltaic and photoelectrochemical applications.
High-efficiency GaInP/GaAs/GaInNAs solar cells grown by combined MBE-MOCVD technique

Triple-junction GaInP/GaAs/GaInNAs solar cells with conversion efficiency of ~29% at AM0 are demonstrated using a combination of molecular beam epitaxy (MBE) and metal-organic chemical vapor deposition (MOCVD) processes. The bottom junction made of GaInNAs was first grown on a GaAs substrate by MBE and then transferred to an MOCVD system for subsequent overgrowth of the two top junctions. The process produced repeatable cell characteristics and uniform efficiency pattern over 4-inch wafers. Combining the advantages offered by MBE and MOCVD opens a new perspective for fabrication of high-efficiency tandem solar cells with three or more junctions.

General information
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Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, CESI S.p.A.
Authors: Tukiainen, A., Aho, A., Gori, G., Polojärvi, V., Casale, M., Greco, E., Isoaho, R., Aho, T., Raappana, M., Campesato, R., Guina, M.
Keywords: (multijunction solar cells, molecular beam epitaxy, metal-organic chemical vapor deposition, dilute nitride semiconductors)
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Publication Forum (2016): 2
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Publication Forum (2015): 2
Scopus rating (2014): 3.279 3.874
Publication Forum (2014): 2
Scopus rating (2013): 3.974 5.653
Publication Forum (2013): 2
Scopus rating (2012): 3.478 5.082
Publication Forum (2012): 2
Scopus rating (2011): 3.251 5.999
Scopus rating (2009): 3.18 3.256
Scopus rating (2008): 2.537 2.473
Scopus rating (2007): 1.711 2.124
Finite temperature path-integral modeling of quantum dot cellular automata

General information
State: Published
Organisations: Department of Physics, Research group: Semiconductor Technology and Applications, Optoelectronics Research Centre, Research area: Computational Physics, Research group: Electronic Structure Theory
Authors: Tiihonen, J., Schramm, A., Kylänpää, I., Rantala, T.
Publication date: 29 Mar 2016
Peer-reviewed: Unknown
Links:
Research output: Scientific › Paper, poster or abstract

Numerical and Experimental Study on Inertial Impactors
One of the most important physical properties that defines the behavior of an aerosol particle is its size. Size defines to a great extent how particles behave in physical and chemical processes. Applying experimental and numerical methods, this thesis studies the fundamentals of the operation of impactors, the instruments that are used to measure the size of aerosol particles.

The first part of the thesis develops a CFD simulation approach, which is suitable for low pressure impactors and their verification. The CFD model is then used to the study parameters that affect the shape of a low pressure impactor’s collection efficiency curve. The second part focuses on the applications of these findings by introducing two new impactors: a variable nozzle area impactor (VNAI), designed for detailed study of particle behavior in collisions, and a high-resolution low-pressure cascade impactor (HRLPI), used in combination with electrical detection to measure nanoparticle size distribution.

Simulations showed that the steepness of the collection efficiency curve depends on the uniformity of the impaction conditions in the impactor jet. Conditions were defined in terms of static pressure, velocity, and particle stopping distance profiles in the cross section of the jet. Uniform impaction conditions and a steep cut-curve were achieved at a short throat, low pressure impactor stage.

In the devised VNAI impactor, particles showed very uniform impaction velocities, a fact that was used to examine the critical velocity of the rebound of spherical silver particles. The critical velocities were several orders of magnitude lower than those for micron sized particles. This may be explained by a different material pair used in the experiments and previous studies. The HRLPI was designed based on instrument response simulations to gain maximum information on aerodynamic size distribution and to guarantee robust inversion characteristics in real-time measurement. This was achieved with roughly ten stages per size decade and with slit type, short-throat nozzles.

This thesis sheds light on some still unanswered questions in impactor theory and successfully applies the theory to practise by introducing new high resolution impactors for nanoparticle research.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Site-controlled InAs quantum dot chains coupled to surface plasmons

Plasmonic hybrid nanostructures are material combinations where the plasmonic metal structure enables optical field confinement, while the other ingredients provide additional functionality, such as emission, absorption or optical nonlinearity. In particular, epitaxial InAs quantum dots (QD) embedded in a single-crystal GaAs matrix are highly efficient quantum emitters that can be integrated as plasmonic-semiconductor hybrids to realize various on-chip functions. In this letter, we demonstrate QD-plasmon coupling in a hybrid structure consisting of site-controlled InAs/GaAs quantum dot chains (QDC) in the proximity of an Ag film. The optical properties of the QDC-plasmon system are investigated using a cleaved-edge photoluminescence (PL) geometry, which allows us to probe the vertical and horizontal polarizations of the PL emission. We demonstrate plasmonic enhancement of both PL decay rate and vertical polarization of the PL emission with decreasing separation of the QDCs and the Ag film. The ability to couple site-controlled InAs QDCs with surface plasmons is a significant step towards exploitation of high quality epitaxial quantum dots as gain or loss compensation in subwavelength plasmonic metal structures, such as waveguide networks, quantum plasmonic structures, and metamaterials.
A thorough simulation study is carried out on thermal and quantum delocalization effects on the feasibility of a quantum-dot cellular automata (QCA) cell. The occupation correlation of two electrons is modeled with a simple four-site array of harmonic quantum dots (QD). QD sizes range from 20 nm to 40 nm with site separations from 20 nm to 100 nm, relevant for state-of-the-art GaAs/InAs semiconductor technology. The choice of parameters introduces QD overlap, which is only simulated properly with exact treatment of strong Coulombic correlation and thermal equilibrium quantum statistics. These are taken into account with path integral Monte Carlo approach. Thus, we demonstrate novel joint effects of quantum delocalization and decoherence in QCA, but also highly sophisticated quantitative evidence supporting the traditional relations in pragmatic QCA design. Moreover, we show the effects of dimensionality and spin state, and point out the parameter space conditions, where the 'classical' treatment becomes invalid.
Dilute Nitride Four-Junction Solar Cell

General information
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Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Optoelectronics Research Centre, Tampere University of Technology
Publication date: 2016
Peer-reviewed: Unknown
Event: Research output: Scientific › Paper, poster or abstract

Dilute nitride solar cells fabricated by combined MBE-MOCVD epitaxy

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Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
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Electronic versions: CPV-12_Guina_MBE-MOCVD_update
Research output: Scientific › Paper, poster or abstract

High efficiency dilute nitride solar cells: Simulations meet experiments
Parameter extraction procedure and simulation of dilute nitride solar cells are reported. Using PC1D simulation and fitting to experimental current-voltage and external quantum efficiency data, we retrieve the phenomenological material parameters for GaInNAs solar cells. Based on these, we have constructed a model that can explain the changes in short circuit current and open circuit voltage of n-i-p solar cells subjected to rapid thermal annealing. The model reveals that non-annealed MBE-grown GaInNAs material has an n-type doping that evolves to p-type upon rapid thermal annealing. The change of doping type and the shift of the physical location of the pn-junction were confirmed by Kelvin-probe force microscopy. The PC1D modelling was found to work well also for GaInNAs p-i-n solar cells with opposite polarity. It was also found that the GaInNAs lower doping levels in p-i-n solar cells grown at lowered As/III flux ratios were associated with increased carrier lifetimes.

General information
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Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Tukiainen, A., Aho, A., Polojärvi, V., Ahorinta, R., Guina, M.
Number of pages: 20
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Publication date: 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Environmental Engineering, Energy(all), Physics and Astronomy(all), Materials Science(all)

Publication information
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Volume: 5
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Article number: 8
ISSN (Print): 1904-4720
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Publication Forum (2017): 0
Scopus rating (2016): 0.132 0.27
Publication Forum (2016): 0
High-efficiency III-V solar cells: From drawing board to real devices

The record solar cell conversion efficiency of 46% at concentrated sunlight has been demonstrated by direct bonding technique [1]. Regardless of the high efficiencies obtained using the direct wafer bonding technique, the conventional monolithic approach used in commercial solar cell production has several benefits, including production technology and cost-related factors. And yet, there is a high un-used potential, particularly in new materials that can be grown lattice-matched onto GaAs or Ge substrates. For example, by utilizing dilute nitride materials in multijunction solar cell structures with more than three junctions and by carefully optimizing structural elements and manufacturing technology, efficiencies exceeding 50% is a realistic target [2]. Here we review our theoretical and experimental work carried out on development of various parts of high-efficiency multijunction solar cells based on GaInNAsSb-based materials, i.e., dilute nitrides. First of all, we have developed a molecular beam epitaxy process for GaInNAsSb sub-junction with very high external quantum efficiency exceeding 90%. This building block is essential for achieving high conversion efficiency for GaInP/GaAs/GaInNAsSb triple-junction solar cells. Secondly, the use of a variety of electro-optical simulation tools such as Crosslight APSYS, Silvaco TCAD, PC1D, Essental MacLeod and semi-empirical analytical models combined with experimental work on numerous test samples have helped in fabricating ultra-low specific resistivity tunnel junctions and high-quality sub-junctions based on conventional III-V materials such as GaInP and GaAs to be integrated with the dilute nitride sub-junction. Thirdly, we have also extracted important material-specific physical parameters such as carrier lifetimes, mobilities and concentrations for dilute nitrides by matching the simulations to experimental solar cell device characteristics [3]. The extracted parameters are used for refining the simulation models which provide deeper understanding of the device physics. The work done so far has led to a rapid increase in conversion efficiency of our GaInP/GaAs/GaInNAsSb triple-junction solar cells – at a pace of ~5 %-points/year since 2012. High-efficiency solar cells with efficiencies of 29% and 31% at one sun (AM0 and AM1.5G, respectively) and 36–39% under concentrated sunlight (at ~70 suns) have already been demonstrated [4,5]. Additionally, the effects of various optical and structural design elements related to fabrication of real III-V multijunction solar cells will be critically reviewed. Especially, we will concentrate on the pros and cons of backside reflector structure architectures – including various planar reflector types and Lambertian scatterers – and nanostructured antireflection coatings [6] which are currently widely employed for solar cell photon management. The consequences of adding such elements to the fabrication process and impact on improving the conversion efficiency towards >50% efficiency are assessed.
Optimizing iron alloy catalyst materials for photoelectrochemical water splitting: Passivation of FeCr alloy surface by water vapour using near-ambient-pressure photoelectron spectroscopy

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Optoelectronics Research Centre, Research group: Surface Science, MAX IV Laboratory, Lund University
Authors: Lahtonen, K., Hannula, M., Ali-Löytty, H., Hirsimäki, M., Urpelainen, S., Valden, M.
Keywords: (Synchrotron, Steel, photoelectrochemical water splitting, Passivation, near-ambient-pressure photoelectron spectroscopy, APXPS)
Number of pages: 2
Publication date: 2016

Site-controlled InAs Quantum Dots Coupled to Surface Plasmons

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Department of Electronics and Communications Engineering, Research group: Laboratory for Future Electronics, Research group: Nanophotonics
Authors: Hakkarainen, T. V., Tommila, J. T., Schramm, A., Simonen, J. P. J., Niemi, K. T., Strelow, C., Kipp, T., Kontio, J. M., Guina, M.
Publication date: 2016
Peer-reviewed: Unknown
Research output: Scientific › Paper, poster or abstract

Site-controlled InAs Quantum Dots for Plasmonics
We present site-controlled epitaxy of InAs quantum dots (QD) for plasmonics and report QD-plasmon coupling in a hybrid structure consisting of site-controlled InAs/GaAs QD chains in the proximity of an Ag film.

General information
State: Published
Organisation: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Research group: Laboratory for Future Electronics, Department of Physics
Authors: Hakkarainen, T., Tommila, J., Schramm, A., Simonen, J., Niemi, T., Strelow, C., Kipp, T., Kontio, J., Guina, M.
Keywords: ((250.5403) Plasmonics, (160.4236) Nanomaterials, (160.6000) Semiconductor materials)
Publication date: 2016
Transformation of ALD grown TiO2 film to topographically microstructured titanium silicide for photonics applications

General information
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Links: https://www.maxlab.lu.se/node/2032#I311-PEEM_ (Reports 2015 - Synchrotron Radiation)
Research output: Professional › Commissioned report

X-ray photoelectron spectroscopy of electrochemical interfaces for solar fuel production

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Surface Science
Authors: Ali-Löytty, H., Valden, M.
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Event: Paper presented at Physics days 2016, Oulu, Finland.
Research output: Scientific › Paper, poster or abstract

Structure of amorphous Ag/Ge/S alloys: experimentally constrained density functional study

Density functional/molecular dynamics simulations have been performed to determine structural and other properties of amorphous Ag/Ge/S and Ge/S alloys. In the former, the calculations have been combined with experimental data (x-ray and neutron diffraction, extended x-ray absorption fine structure). Ag/Ge/As alloys have high ionic conductivity and are among the most promising candidates for future memristor technology. We find excellent agreement between the experimental results and large-scale (500 atoms) simulations in Ag/Ge/S, and we compare and contrast the structures of Ge/S and Ag/Ge/S. The calculated electronic structures, vibrational densities of states, ionic mobilities, and cavity distributions of the amorphous materials are discussed and compared with data on crystalline phases where available. The high mobility of Ag in solid state electrolyte applications is related to the presence of cavities and can occur via jumps to a neighbouring vacant site.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research group: Materials and Molecular Modeling, Computational Science X (CompX)
Authors: Akola, J., Beuneu, B., Jones, R. O., Jóvári, P., Kaban, I., Kolář, J., Voleská, I., Wágner, T.
Publication date: 9 Dec 2015
Finite-size effects and interactions in artificial graphene formed by repulsive scatterers

We carry out a numerical real-space study on electrons confined in a two-dimensional triangular lattice of repulsive scattering centres. The system represents a qualitative model of molecular graphene, where the electron gas is confined between the scattering molecules in a hexagonal configuration. Our main interest is, on one hand, in the comparability of a finite system (flake) and a fully periodic one, and, on the other hand, in the role of the Coulombic electron-electron interactions and the relative strength of the scattering centres. Our real-space study shows in detail how the density of states of the fully periodic system-containing the Dirac point-is gradually formed as the size of the flake is increased. Good qualitative agreement with the experimental density of states is obtained. Our study confirms the minor role of the electron-electron interactions with selected system parameters, and shows in detail that large scattering amplitudes are required to obtain a distinctive Dirac point in the density of states.
Unintentional boron contamination of MBE-grown GaInP/AlGaInP quantum wells

The effects of unintentional boron contamination on optical properties of GaInP/AlGaInP quantum well structures grown by molecular beam epitaxy (MBE) are reported. Photoluminescence and secondary-ion mass spectrometry (SIMS) measurements revealed that the optical activity of boron-contaminated quantum wells is heavily affected by the amount of boron in GaInP/AlGaInP heterostructures. The boron concentration was found to increase when cracking temperature of the phosphorus source was increased. Boron incorporation was enhanced also when aluminum was present in the material.
Aging scaled Brownian motion

Scaled Brownian motion (SBM) is widely used to model anomalous diffusion of passive tracers in complex and biological systems. It is a highly nonstationary process governed by the Langevin equation for Brownian motion, however, with a power-law time dependence of the noise strength. Here we study the aging properties of SBM for both unconfined and confined motion. Specifically, we derive the ensemble and time averaged mean squared displacements and analyze their behavior in the regimes of weak, intermediate, and strong aging. A very rich behavior is revealed for confined aging SBM depending on different aging times and whether the process is sub- or superdiffusive. We demonstrate that the information on the aging factorizes with respect to the lag time and exhibits a functional form that is identical to the aging behavior of scale-free continuous time random walk processes. While SBM exhibits a disparity between ensemble and time averaged observables and is thus weakly nonergodic, strong aging is shown to effect a convergence of the ensemble and time averaged mean squared displacement. Finally, we derive the density of first passage times in the semi-infinite domain that features a crossover defined by the aging time.
Controlled high-fidelity navigation in the charge stability diagram of a double quantum dot

We propose an efficient control protocol for charge transfer in a double quantum dot. We consider numerically a two-dimensional model system, where the quantum dots are subjected to time-dependent electric fields corresponding to experimental gate voltages. Our protocol enables navigation in the charge stability diagram from a state to another through controllable variation of the fields. We show that the well-known adiabatic Landau-Zener transition-when supplemented with a time-dependent field tailored with optimal control theory-can remarkably improve the transition speed. The results also lead to a simple control scheme obtained from the experimental charge stability diagram that requires only a single parameter. Eventually, we can achieve the ultrafast performance of the composite pulse protocol.
that allows the system to be driven at the quantum speed limit.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research group: Quantum Control and Dynamics, Research area: Computational Physics, Computational Science X (CompX), UNNE, Consejo Nacional de Investigaciones Cientificas y Tecnicas (CONICET), CONICET, Inst Modelado & Innovac Tecnol, Fac Ciencias Exactas & Nat & Agrimensura
Authors: Acosta Coden, D. S., Romero, R. H., Räsänen, E.
Keywords: (quantum dots, charge stability diagram, quantum control, PULSES)
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Publication Forum (2016): 2
Scopus rating (2015): 0.824 0.754
Web of Science (2015): 2.209 2.199 8.4 0.867 0.06767 0.857
Publication Forum (2015): 2
Scopus rating (2014): 1.217 0.951
Web of Science (2014): 2.346 2.507 7.7 0.727 0.09324 1.004
Publication Forum (2014): 2
Scopus rating (2013): 1.297 1.022
Publication Forum (2013): 2
Scopus rating (2012): 1.659 1.166
Publication Forum (2012): 2
Scopus rating (2011): 1.627 1.166
Scopus rating (2010): 1.654 1.053
Scopus rating (2009): 1.529 1.019
Scopus rating (2008): 1.475 1.08
Scopus rating (2007): 1.564 1.15
Scopus rating (2005): 1.67 1.189
Scopus rating (2004): 1.518 1.169
Scopus rating (2003): 1.338 0.966
Scopus rating (2002): 1.299 1.119
Scopus rating (2001): 1.232 1.007
Scopus rating (1999): 1.449 1.132
Original language: English
DOIs: 10.1088/0953-8984/27/11/115303
Source: WOS
Source-ID: 000350749000007
Research output: Scientific - peer-review › Article

**Perfect magnetic mirror and simple perfect absorber in the visible spectrum**

Known experimental artificial magnetic conductors for terahertz and optical frequencies are formed by arrays of nanoparticles of various shapes. In this paper, we show that artificial magnetic conductors for the visible spectrum can be realized as simple, effectively quasistatic resonating structures, where the effective inductance is due to the magnetic flux inside a uniform metal substrate, and the effective capacitance is due to electric polarization of a thin uniform dielectric cover. To illustrate the main potential application of artificial magnetic conductors, we concentrate on the perfect-
absorption regime, achieved by adjusting the loss factor of the artificial magnetic conductor to match its real input impedance to free space. We provide approximate analytical design formulas and introduce a simple equivalent circuit to explain the physical mechanism of emulation of magnetic response and perfect absorption of light. A prototype of a nearly perfect absorber for optical (from green to ultraviolet) frequencies is designed and experimentally tested. The results confirm the theoretical predictions and show polarization insensitivity and angular independence of response in a wide range of incidence angles.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics, Aalto University, University of Texas at Austin
Publication date: 11 Mar 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Condensed Matter Physics, Electronic, Optical and Magnetic Materials

Publication information
Journal: Physical Review B
Volume: 91
Issue number: 11
Article number: 115305
ISSN (Print): 1098-0121
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.939 1.0
Publication Forum (2016): 2
Scopus rating (2015): 1.943 1.008
Publication Forum (2015): 2
Scopus rating (2014): 2.656 1.302
Web of Science (2014): 3.736 3.583 9.6 0.93 0.59802 1.331
Publication Forum (2014): 2
Scopus rating (2013): 2.804 1.348
Publication Forum (2013): 2
Scopus rating (2012): 3.159 1.397
Publication Forum (2012): 2
Scopus rating (2011): 3.306 1.433
Scopus rating (2010): 3.303 1.45
Scopus rating (2008): 2.949 1.525
Scopus rating (2007): 2.925 1.609
Scopus rating (2006): 2.799 1.56
Scopus rating (2005): 2.748 1.587
Scopus rating (2004): 2.718 1.583
Scopus rating (2003): 2.71 1.512
Scopus rating (2002): 2.782 1.704
Scopus rating (2001): 2.968 1.648
Scopus rating (2000): 2.979 1.629
Scopus rating (1999): 3.077 1.588
Original language: English
DOIs: 10.1103/PhysRevB.91.115305
Source: Scopus
Source-ID: 84926444192
Research output: Scientific - peer-review › Article

Second-harmonic generation imaging of semiconductor nanowires with focused vector beams
We use second-harmonic generation (SHG) with focused vector beams to investigate individual vertically aligned GaAs nanowires. Our results provide direct evidence that SHG from oriented nanowires is mainly driven by the longitudinal field along the nanowire growth axis. Consequently, focused radial polarization provides a superior tool to characterize such
nanowires compared to linear polarization, also allowing this possibility in the native growth environment. We model our experiments by describing the SHG process for zinc-blende structure and dipolar bulk nonlinearity.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Optics, Research group: Nonlinear Optics, Tampere University of Technology, Frontier Photonics, Aalto University, Department of Micro- and Nanosciences, Aalto University, Department of Applied Physics and Nanomicroscopy Center
Authors: Bautista, G., Mäkitalo, J., Chen, Y., Dhaka, V., Grasso, M., Karvonen, L., Jiang, H., Huttunen, M. J., Huhtio, T., Lipsanen, H., Kauranen, M.
Keywords: (modeling, nonlinear imaging, radial polarization, Second-harmonic generation, semiconductor)
Number of pages: 6
Pages: 1564-1569
Publication date: 6 Feb 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Condensed Matter Physics, Bioengineering, Chemistry(all), Materials Science(all), Mechanical Engineering

Publication information
Journal: Nano Letters
Volume: 15
Issue number: 3
ISSN (Print): 1530-6984
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 7.983 2.881
Publication Forum (2016): 3
Web of Science (2015): 13.779 14.867 5.1 2.177 0.36775 4.869
Scopus rating (2014): 8.283 3.499
Web of Science (2014): 13.592 14.887 4.9 2.552 0.36396 4.889
Publication Forum (2014): 3
Scopus rating (2013): 9.085 3.41
Publication Forum (2013): 3
Scopus rating (2012): 10.253 3.615
Publication Forum (2012): 3
Scopus rating (2009): 7.868 2.891
Scopus rating (2008): 7.649 2.991
Scopus rating (2007): 6.983 2.954
Scopus rating (2005): 6.698 2.86
Scopus rating (2004): 5.259 2.336
Scopus rating (2003): 3.419 2.07
Scopus rating (2002): 2.417 1.726
Original language: English
DOIs:
10.1021/nl503984b
Links:
http://www.scopus.com/inward/record.url?scp=84924595561&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
AUX=fys,"Grasso, Marco"
EXT="Dhaka, Veer"
EXT="Huttunen, Mikko J."
Source: Scopus
Source-ID: 84924595561
Facilitation of polymer looping and giant polymer diffusivity in crowded solutions of active particles

We study the dynamics of polymer chains in a bath of self-propelled particles (SPP) by extensive Langevin dynamics simulations in a two-dimensional model system. Specifically, we analyse the polymer looping properties versus the SPP activity and investigate how the presence of the active particles alters the chain conformational statistics. We find that SPPs tend to extend flexible polymer chains, while they rather compactify stiffer semiflexible polymers, in agreement with previous results. Here we show that higher activities of SPPs yield a higher effective temperature of the bath and thus facilitate the looping kinetics of a passive polymer chain. We explicitly compute the looping probability and looping time in a wide range of the model parameters. We also analyse the motion of a monomeric tracer particle and the polymer’s centre of mass in the presence of the active particles in terms of the time averaged mean squared displacement, revealing a giant diffusivity enhancement for the polymer chain via SPP pooling. Our results are applicable to rationalising the dimensions and looping kinetics of biopolymers at constantly fluctuating and often actively driven conditions inside biological cells or in suspensions of active colloidal particles or bacteria cells.

Publication information
Journal: New Journal of Physics
Volume: 17
Issue number: 11
ISSN (Print): 1367-2630
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.788 1.031
Publication Forum (2016): 2
Scopus rating (2015): 1.938 1.047
Web of Science (2015): 3.57 3.501 4.7 1.118 0.10691 1.706
Publication Forum (2015): 2
Scopus rating (2014): 2.806 1.307
Web of Science (2014): 3.558 3.664 4.4 0.861 0.12987 1.982
Publication Forum (2014): 2
Scopus rating (2013): 2.871 1.372
Publication Forum (2013): 2
Scopus rating (2012): 3.352 1.533
Publication Forum (2012): 2
Scopus rating (2011): 3.47 1.634
Scopus rating (2010): 3.395 1.421
Green (In,Ga,Al)P-GaP light-emitting diodes grown on high-index GaAs surfaces

We report on green (550-560 nm) electroluminescence (EL) from (Al<sub>0.5</sub>Ga<sub>0.5</sub>)<sub>0.5</sub>In<sub>0.5</sub>P-(Al<sub>0.8</sub>Ga<sub>0.2</sub>)<sub>0.5</sub>In<sub>0.5</sub>P double p-i-n heterostructures with monolayer-scale tensile strained GaP insertions in the cladding layers and light-emitting diodes (LEDs) based thereupon. The structures are grown side-by-side on high-index and (100) GaAs substrates by molecular beam epitaxy. Cross-sectional transmission electron microscopy studies indicate that GaP insertions are flat, thus the GaP-barrier substrate orientation-dependent heights should match the predictions of the flat model. At moderate current densities (∼500 A/cm<sup>2</sup>) the EL intensity of the structures is comparable for all substrate orientations. Opposite to the (100)-grown strictures, the EL spectra of (211) and (311)-grown devices are shifted towards shorter wavelengths (∼550 nm at room temperature). At high current densities (>1 kA/cm<sup>2</sup>) a much higher EL intensity is achieved for the devices grown on high-index substrates. The integrated intensity of (311)-grown structures gradually saturates at current densities above 4 kA/cm<sup>2</sup>, whereas no saturation is revealed for (211)-grown structures up to the current densities above 14 kA/cm<sup>2</sup>. We attribute the effect to the surface orientation-dependent engineering of the GaP band structure which prevents the escape of the nonequilibrium electrons into the indirect conduction band minima of the p-doped (Al<sub>0.8</sub>Ga<sub>0.2</sub>)<sub>0.5</sub>In<sub>0.5</sub>P cladding layers.

General information

State: Published
Ministry of Education publication type: A4 Article in a conference publication
Keywords: (high-index surface, light-emitting diode, tensile strained barrier)
Publication date: 2015

Host publication information
Volume: 9383
Publisher: SPIE
Article number: 93830E
ISBN (Print): 9781628414738
DOIs: 10.1117/12.2083953
Source: Scopus
Source-ID: 84930074847
Research output: Scientific - peer-review › Conference contribution

Long-term corrosion protection by a thin nano-composite coating

Abstract We report and discuss the corrosion protective properties of a thin nano-composite coating system consisting of an 11 µm thick polyester acrylate (PEA) basecoat, covered by an approximately 1–2 µm thick layer of TiO2 nanoparticles
carrying a 0.05 µm thick hexamethyl disiloxane (HMDSO) top coat. The corrosion protective properties were evaluated on carbon steel substrates immersed in 3 wt% NaCl solution by open circuit potential (OCP) and electrochemical impedance spectroscopy (EIS) measurements. The protective properties of each layer, and of each pair of layers, were also evaluated to gain further understanding of the long-term protective properties offered by the nano-composite coating. The full coating system showed excellent corrosion protective properties in the corrosive environment of 3 wt% NaCl-solution for an extended period of 100 days, during which the coating impedance, at the lower frequency limit (0.01 Hz), remained above 108 O cm². We suggest that the excellent corrosion protective properties of the complete coating system is due to a combination of (i) good adhesion and stability of the PEA basecoat, (ii) the surface roughness and the elongated diffusion path provided by the addition of TiO2 nanoparticles, and (iii) the low surface energy provided by the HMDSO top coat.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: Aerosol Synthesis, SP Technical Research Institute of Sweden
Authors: Ejenstam, L., Tuominen, M., Haapanen, J., Mäkelä, J. M., Pan, J., Swerin, A., Claesson, P. M.
Keywords: (Liquid flame spray, Corrosion, Corrosion protection, Carbon steel, Plasma coating, Impedance spectroscopy)
Pages: 2333–2342
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Applied Surface Science
Volume: 357
Issue number: Part B
ISSN (Print): 0169-4332
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.951 1.225
Publication Forum (2016): 1
Scopus rating (2015): 0.914 1.3
Web of Science (2015): 3.15 2.982 4.9 0.677 0.08258 0.574
Publication Forum (2015): 1
Scopus rating (2014): 0.958 1.477
Web of Science (2014): 2.711 2.735 5.3 0.507 0.07467 0.549
Publication Forum (2014): 2
Scopus rating (2013): 0.965 1.488
Publication Forum (2013): 2
Scopus rating (2012): 0.918 1.373
Publication Forum (2012): 2
Scopus rating (2011): 0.908 1.402
Scopus rating (2010): 0.924 1.141
Scopus rating (2009): 0.842 1.023
Scopus rating (2008): 0.899 1.087
Scopus rating (2007): 0.795 0.945
Scopus rating (2006): 0.852 1.052
Scopus rating (2005): 0.679 0.946
Scopus rating (2004): 0.964 1.126
Scopus rating (2003): 0.988 1.027
Scopus rating (2002): 0.921 0.954
Scopus rating (2001): 0.841 0.796
Scopus rating (2000): 0.866 0.772
Scopus rating (1999): 1.064 0.907
Original language: English
DOIs: 10.1016/j.apsusc.2015.09.238
Measurements of particulates and gas phase precursors emissions from fresh ship plumes during the Big Glenn 2014 Campaign

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Physics, Research area: Aerosol Physics, University of Gothenburg
Authors: Kuuluvainen, H., Faxon, C., Psichoudaki, M., Thomson, E. S., Eriksson, A., Kristensson, A., Svenningson, B., Mellqvist, J., Salo, K., Hallquist, M.
Publication date: 2015

Host publication information
Title of host publication: EAC 2015, European Aerosol Conference, 6-11 September, 2015, Milan, Italy

Bibliographical note
ISBN kysytty, HO.
Ei ole, HO.
Research output: Professional › Conference contribution

Self-consistent total-energy approximation for electron gas systems
Employing a local formula of Parr [J. Chem. Phys. 93, 3060 (1988)] for the electron-electron interaction energy, we derive a self-consistent approximation for the total energy of a general N-electron system. Our scheme works as a local variant of the Thomas-Fermi approximation and yields the total energy and density as a function of the external potential, the number of electrons, and the chemical potential determined upon normalization. Our tests for Hooke’s atoms, jellium, and model atoms up to ~1500 electrons show that reasonable total energies can be obtained with almost negligible computational cost. Our approximation may serve as a useful tool to provide initial results for more advanced approaches that also include binding.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Quantum Control and Dynamics, Department of Physics, Computational Science X (CompX)
Authors: Räsänen, E., Odriazola, A., Makkonen, I., Harju, A.
Number of pages: 6
Pages: 496-501
Publication date: 2015
Peer-reviewed: Yes

Publication information
Volume: 252
Issue number: 3
ISSN (Print): 0370-1972
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.682 0.811
Publication Forum (2016): 1
Scopus rating (2015): 0.674 0.787
Web of Science (2015): 1.522 1.383 9.5 0.379 0.01434 0.466
Publication Forum (2015): 1
Scopus rating (2014): 0.808 0.779
Web of Science (2014): 1.469 1.407 8.8 0.524 0.01673 0.483
Publication Forum (2014): 1
Scopus rating (2013): 0.831 0.793
Publication Forum (2013): 1
Scopus rating (2012): 0.892 0.72
Publication Forum (2012): 1
Triboelectric charging of fungal spores during resuspension and rebound

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group
Authors: Kuuluvainen, H., Saari, S., Mensah-Attipoe, J., Pasanen, P., Reponen, T., Keskinen, J.
Publication date: 2015

Host publication information
Title of host publication: EAC 2015, European Aerosol Conference, 6-11 September, 2015, Milan, Italy

Bibliographical note
ISBN kysytty, HO.
Ei ole, HO.
Research output: Professional › Conference contribution

Ultrasmall microdisk and microring lasers based on InAs/InGaAs/GaAs quantum dots

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, St. Petersburg State Polytechnical University, St. Petersburg Academic University, ITMO University, University of Eastern Finland
Keywords: (Lasers, Microcavities, Microdisks, Microrings, Semiconductor quantum dots)
Publication date: 13 Dec 2014
Peer-reviewed: Yes
ASJC Scopus subject areas: Materials Science(all), Condensed Matter Physics

Publication information
Journal: Nanoscale Research Letters
Biofunctional hybrid materials: bimolecular organosilane monolayers on FeCr alloys

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Frontier Photonics, Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Vuori, L., Leppiniemi, J., Hannula, M., Lahtonen, K., Hirsimäki, M., Nömmiste, E., Costelle, L., Hytönen, V. P., Valden, M.
Number of pages: 10
Pages: 1-10
Publication date: 2014
Peer-reviewed: Yes

Publication Information
Journal: Nanotechnology
Volume: 25
Issue number: 43
Article number: 435603
ISSN (Print): 0957-4484
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.096 0.814
Publication Forum (2016): 2
Scopus rating (2015): 1.18 0.966
Web of Science (2015): 3.573 3.611 6.1 0.819 0.07276 0.961
Publication Forum (2015): 2
Scopus rating (2014): 1.465 1.258
Web of Science (2014): 3.821 3.885 5.5 0.678 0.09114 1.041
Construction of the B88 Exchange-Energy Functional in Two Dimensions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Quantum Control and Dynamics, Department of Physics, Computational Science X (CompX)
Authors: Vilhena, J. G., Räsänen, E., Marques, M. A. L., Pittalis, S.
Number of pages: 6
Pages: 1837-1842
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Chemical Theory and Computation
Volume: 10
Issue number: 5
ISSN (Print): 1549-9618
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.801 1.589
Publication Forum (2016): 2
Scopus rating (2015): 2.795 1.748
Web of Science (2015): 5.301 5.756 4.3 1.134 0.0635 1.768
Publication Forum (2015): 2
Scopus rating (2014): 2.777 1.603
Web of Science (2014): 5.498 5.76 3.9 1.195 0.05994 1.761
Publication Forum (2014): 2
Scopus rating (2013): 2.409 1.578
Publication Forum (2013): 2
Controlling the synergetic effects in (3-aminopropyl) trimethoxysilane and (3-mercaptopropyl) trimethoxysilane coadsorption on stainless steel surfaces

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Frontier Photonics
Number of pages: 11
Pages: 856-866
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Applied Surface Science
Volume: 317
ISSN (Print): 0169-4332
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.951 1.225
Publication Forum (2016): 1
Scopus rating (2015): 0.914 1.3
Web of Science (2015): 3.15 2.982 4.9 0.677 0.08258 0.574
Publication Forum (2015): 1
Scopus rating (2014): 0.958 1.477
Web of Science (2014): 2.711 2.735 5.3 0.507 0.07467 0.549
Publication Forum (2014): 2
Scopus rating (2013): 0.965 1.488
Publication Forum (2013): 2
Scopus rating (2012): 0.918 1.373
Publication Forum (2012): 2
Scopus rating (2011): 0.908 1.402
Scopus rating (2010): 0.924 1.141
Scopus rating (2009): 0.842 1.023
Scopus rating (2008): 0.899 1.087
Scopus rating (2007): 0.795 0.945
Deep levels in 1 eV bandgap dilute nitride antimonide solar cells

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre
Authors: Polojärvi, V., Tukiainen, A., Aho, A., Raappana, M., Aho, T., Schramm, A., Guina, M.
Number of pages: 3
Pages: 1-3
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the 29th European Photovoltaic Solar Energy Conference and Exhibition, EU PVSEC 2014, September 22-26, 2014, Amsterdam, the Netherlands
Publisher: European Environment Agency
ISBN (Print): 3-936338-34-5

Publication series
Name: European photovoltaic solar energy conference
Links:

Bibliographical note
Proceedings can be downloaded via EU PVSEC website: https://www.eupvsec-proceedings.com/proceedings/dvd.html

Density-functional investigation of molecular graphene: CO on Cu(111)

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Quantum Control and Dynamics, Research group: Materials and Molecular Modeling, Department of Physics, Computational Science X (CompX)
Authors: Ropo, M., Paavilainen, S., Akola, J., Räsänen, E.
Number of pages: 5
Pages: 1-5
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Physical Review B
Determination of the functionality of monolayers of aminopropyl trimethoxy silane and mercaptopropyl trimethoxy silane on stainless steel with SR-PES and chemical derivatization

General information
State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Organisations: Optoelectronics Research Centre, Research group: Surface Science
Authors: Vuori, L., Hannula, M., Hirsimäki, M., Tönisoo, A., Nömmiste, E., Valden, M.
Number of pages: 2
Pages: 1-2
Publication date: 2014

Host publication information
Place of publication: Lund, Sweden
Publisher: MAX-LAB
Links:
https://www.maxlab.lu.se/node/1913
Dirac physics in flakes of artificial graphene in magnetic fields

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Quantum Control and Dynamics, Department of Physics, Computational Science X (CompX)
Authors: Aichinger, M., Janecek, S., Kylänpää, I., Räsänen, E.
Number of pages: 5
Pages: 235433-1 - 235433-5
Publication date: 2014
Peer-reviewed: Yes

Publication Information
Journal: Physical Review B
Volume: 89
Issue number: 23
Article number: 235433
ISSN (Print): 1098-0121
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.939 1.0
Publication Forum (2016): 2
Scopus rating (2015): 1.943 1.008
Publication Forum (2015): 2
Scopus rating (2014): 2.656 1.302
Web of Science (2014): 3.736 3.583 9.6 0.93 0.59802 1.331
Publication Forum (2014): 2
Scopus rating (2013): 2.804 1.348
Publication Forum (2013): 2
Scopus rating (2012): 3.159 1.397
Publication Forum (2012): 2
Scopus rating (2011): 3.306 1.433
Scopus rating (2010): 3.303 1.45
Scopus rating (2008): 2.949 1.525
Scopus rating (2007): 2.925 1.609
Scopus rating (2006): 2.799 1.56
Scopus rating (2005): 2.748 1.587
Scopus rating (2004): 2.718 1.583
Scopus rating (2003): 2.71 1.512
Scopus rating (2002): 2.782 1.704
Scopus rating (2001): 2.968 1.648
Scopus rating (2000): 2.979 1.629
Scopus rating (1999): 3.077 1.588
Original language: English
DOI's:
10.1103/PhysRevB.89.235433
Links:
http://journals.aps.org/prb/abstract/10.1103/PhysRevB.89.235433

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-09-30<br/>Publisher name: American Physical Society
Electron magneto-tunneling through single self-assembled InAs quantum dashes

General information
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Quantum Control and Dynamics, Department of Physics, Computational Science X (CompX)
Authors: Shibata, K., Pascher, N., Luukko, P. J. J., Räsänen, E., Schnez, S., Ihn, T., Ensslin, K., Hirakawa, K.
Number of pages: 4
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Applied Physics Express
Volume: 7
Issue number: 4
Article number: 045001
ISSN (Print): 1882-0778

Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.812 0.981
Publication Forum (2015): 1
Scopus rating (2015): 0.752 0.82
Web of Science (2015): 2.265 2.267 3.8 0.544 0.02535 0.784
Publication Forum (2015): 1
Scopus rating (2014): 1.248 1.166
Web of Science (2014): 2.365 2.429 3.5 0.537 0.02591 0.794
Publication Forum (2014): 1
Scopus rating (2013): 1.474 1.369
Publication Forum (2013): 1
Scopus rating (2012): 1.808 1.458
Publication Forum (2012): 1
Scopus rating (2011): 1.796 1.473
Scopus rating (2010): 1.501 1.188
Scopus rating (2009): 0.975 1.18
Scopus rating (2008): 1.158
Scopus rating (2007): 1.153
Scopus rating (2006): 1.348
Scopus rating (2005): 1.183
Scopus rating (2004): 1.306
Scopus rating (2003): 1.276
Scopus rating (2002): 1.482
Scopus rating (2001): 1.498
Scopus rating (2000): 1.1
Scopus rating (1999): 1.157
Original language: English

DOIs:
10.7567/APEX.7.045001

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-09-30<br/>Publisher name: Japan Society of Applied Physics; IOP Publishing
Source: researchoutputwizard
Source-ID: 1492
Research output: Scientific - peer-review › Article
Incorporation model of N into GaInNAs alloys grown by radio-frequency plasma-assisted molecular beam epitaxy

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Frontier Photonics
Authors: Aho, A., Korpijärvi, V., Tukiainen, A., Puustinen, J., Guina, M.
Number of pages: 6
Pages: 1-6
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Applied Physics
Volume: 116
Article number: 213101
ISSN (Print): 0021-8979
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.632 0.815
Publication Forum (2016): 1
Scopus rating (2015): 0.618 0.84
Web of Science (2015): 2.101 2.126 >10.0 0.446 0.20483 0.637
Publication Forum (2015): 1
Scopus rating (2014): 1.005 1.18
Web of Science (2014): 2.183 2.276 9.5 0.452 0.22991 0.682
Publication Forum (2014): 2
Scopus rating (2013): 1.165 1.317
Publication Forum (2013): 2
Scopus rating (2012): 1.305 1.294
Publication Forum (2012): 2
Scopus rating (2011): 1.373 1.318
Scopus rating (2010): 1.47 1.195
Scopus rating (2009): 1.518 1.238
Scopus rating (2008): 1.667 1.338
Scopus rating (2007): 1.708 1.395
Scopus rating (2005): 2.034 1.627
Scopus rating (2004): 2.097 1.602
Scopus rating (2003): 2.019 1.525
Scopus rating (2002): 2.225 1.674
Scopus rating (2001): 2.079 1.554
Scopus rating (2000): 2.338 1.543
Scopus rating (1999): 2.071 1.517
Original language: English
DOIs:
10.1063/1.4903318

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: American Institute of Physics
Source: researchoutputwizard
Source-ID: 57
Research output: Scientific - peer-review › Article

Influence of surface hydroxylation on the oxidation of FeCr in O2 and air

General information
State: Published
Moth eye antireflection coated GaInP/GaAs/GaInNAs solar cell

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre
Authors: Aho, A., Tommila, J., Tukiainen, A., Polojarvi, V., Niemi, T., Guina, M.
Number of pages: 4
Pages: 33-36
Publication date: 2014

Host publication information
Title of host publication: CPV-10 Proceedings, 10th International Conference on Concentrator Photovoltaic Systems, April 7-9, 2014, Albuquerque, NM, USA. AIP Conference Proceedings
Publisher: American Institute of Physics
Publication series
Name: AIP Conference Proceedings
Volume: 1616
ISSN (Print): 0094-243X
ISSN (Electronic): 1551-7616
DOIs:
10.1063/1.4897022

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-10-08<br/>Publisher name: American Institute of Physics
Source: researchoutputwizard
Source-ID: 59
Research output: Scientific - peer-review › Conference contribution

Optimal control of charge with local gates in quantum-dot lattices

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Quantum Control and Dynamics, Department of Physics, Computational Science X (CompX)
Authors: Mardoukhi, Y., Räsänen, E.
Number of pages: 6
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: European Physical Journal B
Prediction of quantum dot characteristics through universal scaling relations

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Quantum Control and Dynamics, Department of Physics, Computational Science X (CompX)
Authors: Odriazola, A., Gonzalez, A., Räsänen, E.
Number of pages: 5
Pages: 355501-1 - 355501-5
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Physics: Condensed Matter
Volume: 26
Proton distribution and dynamics in Y- and Zn-doped BaZrO3

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, Research group: Materials and Molecular Modeling, Department of Physics, Computational Science X (CompX)
Authors: Kitamura, N., Akola, J., Kohara, S., Fujimoto, K., Idemoto, Y.
Number of pages: 7
Pages: 18846-18852
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 118
Issue number: 33
Structure and dynamics in liquid bismuth and Bin clusters: A density functional 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, Research group: Materials and Molecular Modeling, Department of Physics, Computational Science X (CompX)
Authors: Akola, J., Atodiresei, N., Kalikka, J., Larrucea, J., Jones, O.
Number of pages: 10
Pages: 1-10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Chemical Physics
Volume: 141
Issue number: 19
Article number: 194503
ISSN (Print): 0021-9606
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.073 0.755
Publication Forum (2016): 1
Scopus rating (2015): 0.953 0.767
Web of Science (2015): 2.894 2.95 >10.0 0.786 0.16944 0.873
Publication Forum (2015): 1
Scopus rating (2014): 1.386 0.989
Web of Science (2014): 2.952 3.017 >10.0 0.731 0.18296 0.916
Publication Forum (2014): 3
Structure, electronic, and vibrational properties of amorphous AsS2 and AgAsS2: Experimentally constrained density functional 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, Research group: Materials and Molecular Modeling, Department of Physics, Computational Science X (CompX)
Authors: Akola, J., Jovari, P., Kaban, I., Voleska, I., Kolar, J., Wagner, T., Jones, O.
Number of pages: 9
Pages: 1-9
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Physical Review B
Volume: 89
Issue number: 6
Article number: 064202
ISSN (Print): 1098-0121
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.939 1.0
Publication Forum (2016): 2
Scopus rating (2015): 1.943 1.008
Publication Forum (2015): 2
Scopus rating (2014): 2.656 1.302
Web of Science (2014): 3.736 3.583 9.6 0.93 0.59802 1.331
Publication Forum (2014): 2
Scopus rating (2013): 2.804 1.348
Publication Forum (2013): 2
In Situ XPS Studies of Electrochemically Negatively Polarized Molybdenum Carbide Derived Carbon Double Layer Capacitor Electrode

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Frontier Photonics
Authors: Tonisoo, A., Krusma, J., Pärna, R., Kikas, A., Hirsimäki, M., Nommi, E., Lust, E.
Number of pages: 10
Pages: A1084-A1093
Publication date: 2013
Scaling in the correlation energies of two-dimensional artificial atoms

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Quantum Control and Dynamics, Department of Physics, Computational Science X (CompX)
Authors: Odriazola, A., Ervasti, M. M., Makkonen, I., Delgado, A., Gonzalez, A., Räsänen, E., Harju, A.
Number of pages: 5
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Physics: Condensed Matter
Volume: 25
Issue number: 50
ISSN (Print): 0953-8984
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.881 0.754
Publication Forum (2016): 2
Scopus rating (2015): 0.824 0.754
Web of Science (2015): 2.209 2.199 8.4 0.867 0.06767 0.857
Publication Forum (2015): 2
Scopus rating (2014): 1.217 0.951
Web of Science (2014): 2.346 2.507 7.7 0.727 0.09324 1.004
Publication Forum (2014): 2
Scopus rating (2013): 1.297 1.022
Publication Forum (2013): 2
Scopus rating (2012): 1.659 1.166
Publication Forum (2012): 2
Scopus rating (2011): 1.627 1.166
Scopus rating (2010): 1.654 1.053
Scopus rating (2009): 1.529 1.019
Scopus rating (2008): 1.475 1.08
Scopus rating (2007): 1.564 1.15
Scopus rating (2005): 1.67 1.189
Scopus rating (2004): 1.518 1.169
Scopus rating (2003): 1.338 0.966
Scopus rating (2002): 1.299 1.119
Scopus rating (2001): 1.232 1.007
Scopus rating (1999): 1.449 1.132
Original language: English
DOIs:
Two-electron quantum dot in tilted magnetic fields: Sensitivity to the confinement model

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Quantum Control and Dynamics, Department of Physics, Computational Science X (CompX)
Authors: Frostad, T., Hansen, J. P., Wesslen, C., Lindroth, E., Räsänen, E.
Number of pages: 6
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: European Physical Journal B
Volume: 86
Issue number: 10
Article number: 430
ISSN (Print): 1434-6028
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.452 0.654
Publication Forum (2016): 1
Scopus rating (2015): 0.53 0.744
Web of Science (2015): 1.223 1.243 8.3 0.429 0.01376 0.456
Publication Forum (2015): 1
Scopus rating (2014): 0.657 0.717
Web of Science (2014): 1.345 1.366 7.8 0.293 0.01801 0.538
Publication Forum (2014): 2
Scopus rating (2013): 0.727 0.805
Publication Forum (2013): 2
Scopus rating (2012): 0.851 0.886
Publication Forum (2012): 2
Scopus rating (2011): 1.027 0.924
Scopus rating (2010): 1.087 0.871
Scopus rating (2009): 0.973 0.815
Scopus rating (2008): 1.099 0.837
Scopus rating (2007): 1.158 0.933
Scopus rating (2006): 1.146 0.933
Scopus rating (2005): 1.305 0.958
Scopus rating (2004): 1.3 0.928
Scopus rating (2003): 1.297 0.856
Scopus rating (2002): 1.396 1.06
Scopus rating (2001): 1.497 1.025
Scopus rating (2000): 1.843 1.394
Scopus rating (1999): 1.648 1.156
Original language: English
DOIs:
10.1140/epjb/e2013-40677-x
Effect of different annealing temperatures and SiO2/Si(100) substrate on the properties of nickel containing titania thin sol-gel films

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research group: Surface Science, Frontier Photonics
Authors: Pärna, R., Joost, U., Nommiste, E., Kääambre, T., Kikas, A., Kuusik, I., Kink, I., Hirsimäki, M., Kisand, V.
Pages: 953-965
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Physica Status Solidi A: Applications And Materials Science
Volume: 209
Issue number: 5
ISSN (Print): 1862-6300
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.683 0.849
Publication Forum (2016): 1
Scopus rating (2015): 0.688 0.89
Web of Science (2015): 1.648 1.446 9.7 0.514 0.01361 0.404
Publication Forum (2015): 1
Scopus rating (2014): 0.692 0.901
Web of Science (2014): 1.616 1.481 9.5 0.385 0.01493 0.42
Publication Forum (2014): 1
Scopus rating (2013): 0.772 0.904
Publication Forum (2013): 1
Scopus rating (2012): 0.865 0.929
Publication Forum (2012): 1
Scopus rating (2011): 0.964 0.981
Scopus rating (2010): 0.872 0.794
Scopus rating (2009): 0.918 0.831
Scopus rating (2008): 0.818 0.791
Scopus rating (2007): 1.003 0.992
Scopus rating (2006): 0.833 0.791
Scopus rating (2005): 0.776 0.718
Scopus rating (2004): 0.697 0.632
Scopus rating (2003): 0.832 0.73
Scopus rating (2002): 0.824 0.806
Scopus rating (2001): 0.824 0.787
Scopus rating (2000): 1.107 0.914
Scopus rating (1999): 0.866 0.815
Original language: English
DOIs: 10.1002/pssa.201127641

Bibliographical note
Contribution: organisation=fys,FACT1=1
Publisher name: Wiley
Source: researchoutputwizard
Source-ID: 5020
Research output: Scientific - peer-review › Article