Decreasing Defect-State Density of $\text{Al}_2\text{O}_3/\text{Ga}_{x}\text{In}_{1-x}\text{As}$ Device Interfaces with InOx Structures

Control of defect densities at insulator/Ga$_x$In$_{1-x}$As interfaces is essential for optimal operation of various devices like transistors and infrared detectors to suppress, for example, nonradiative recombination, Fermi-level pinning, and leakage currents. It is reported that a thin InOx interface layer is useful to limit the formation of these defects by showing effect of InOx on quantum efficiency of Ga$_{0.45}$In$_{0.55}$As detector and on photoluminescence of GaAs. A study of the Al$_2$O$_3$/GaAs interface via hard X-ray synchrotron photoelectron spectroscopy reveals chemical structure changes at the interface induced by this beneficial InOx incorporation: the InOx sheet acts as an O diffusion barrier that prevents oxidation of GaAs and concomitant As bond rupture.

Tuning Localized Surface Plasmon Resonances by Self-Assembly in Multi-Metal Nanostructures

Block copolymers together with conventional nanolithography offer an intriguing possibility to realize complex photonic nanostructures that would otherwise be impossible or extremely difficult to manufacture. Sub-wavelength nanostructures made of noble metals exhibit localized surface plasmon resonances that can be tailored by tuning the geometry of the structures. We demonstrate that combining plasmonic nanoarrays with block copolymer self-assembly allows realization of multi-metal structures that display altered optical behavior.

A high speed electron-beam lithography technique (Dots-On-The-Fly) was used to fabricate arrays of thin, plasmonic gold structures, which then acted as a directing template for the self-assembly of asymmetric poly(styrene-b-2-vinyl pyridine) (PS-P2VP). Solvothermal annealing resulted in the PS-P2VP assembling in the gap regions of the plasmonic structures. The P2VP domains could then be converted into a variety of metals such as Au, Ag or Pt to populate the gap with plasmonic nanoparticles. 3D and 2D computational modeling was used to estimate the effects of geometry and material combinations on the far field spectrum and the local field-enhancement in the gap. Self-assembled multimaterial plasmonic devices have various applications in near field sensing, nonlinear optical interactions and photocatalysis.
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.
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.
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.

General information
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Organisations: Optoelectronics Research Centre, Research group: Surface Science, MAX IV Laboratory, Lund University
Authors: Vuori, L., Ali-Löytty, H., Lahtonen, K., Hannula, M., Lehtonen, E., Niu, Y., Valden, M.
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Scopus rating (2012): SJR 0.479 SNIP 0.886 CiteScore 0.67
Scopus rating (2011): SJR 0.586 SNIP 1.404 CiteScore 1.03
Scopus rating (2010): SJR 0.707 SNIP 1.387
Scopus rating (2009): SJR 0.912 SNIP 1.573
Scopus rating (2008): SJR 0.793 SNIP 1.056
Scopus rating (2007): SJR 0.983 SNIP 1.199
Scopus rating (2006): SJR 0.89 SNIP 1.229
Scopus rating (2005): SJR 1.104 SNIP 1.421
Scopus rating (2004): SJR 1.122 SNIP 1.441
Scopus rating (2003): SJR 0.957 SNIP 1.771
Scopus rating (2002): SJR 1.149 SNIP 1.574
Scopus rating (2001): SJR 1.541 SNIP 1.792
Scopus rating (2000): SJR 1.028 SNIP 2.089
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Original language: English
ASJC Scopus subject areas: Surfaces and Interfaces, Surfaces, Coatings and Films, Electrochemistry
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Research output: Scientific - peer-review » Article

Performance of Dilute Nitride Triple Junction Space Solar Cell Grown by MBE
Dilute nitride arsenide antimonide compounds offer widely tailorable band-gaps, ranging from 0.8 eV to 1.4 eV, for the development of lattice-matched multijunction solar cells with three or more junctions. Here we report on the performance of GaInP/GaAs/GaInNAsSb solar cell grown by molecular beam epitaxy. An efficiency of 27% under AM0 conditions is demonstrated. In addition, the cell was measured at different temperatures. The short circuit current density exhibited a temperature coefficient of 0.006 mA/cm²/°C while the corresponding slope for the open circuit voltage was ~6.8 mV/°C. Further efficiency improvement, up to 32%, is projected by better current balancing and structural optimization.

General information
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Organisations: Photonics, Research group: ORC
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.
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Scopus rating (2014): SJR 0.276 SNIP 0.614 CiteScore 0.6
Scopus rating (2013): SJR 0.345 SNIP 0.556 CiteScore 0.63
Scopus rating (2012): SJR 0.287 SNIP 0.575 CiteScore 0.54
Scopus rating (2011): SJR 0.254 SNIP 0.471 CiteScore 0.43
Scopus rating (2010): SJR 0.289 SNIP 0.409
Scopus rating (2009): SJR 0.262 SNIP 0.419
Scopus rating (2008): SJR 0.225 SNIP 0.316
Scopus rating (2007): SJR 0.29 SNIP 0.449
Scopus rating (2006): SJR 0.283 SNIP 0.333
Scopus rating (2005): SJR 0.273 SNIP 0.391
Scopus rating (2004): SJR 0.345 SNIP 0.406
Scopus rating (2003): SJR 0.25 SNIP 0.325
Scopus rating (2002): SJR 0.28 SNIP 0.356
Scopus rating (2001): SJR 0.324 SNIP 0.416
Scopus rating (2000): SJR 0.313 SNIP 0.362
Scopus rating (1999): SJR 0.341 SNIP 0.282
Original language: English
DOIs:
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.

Fabrication of topographically microstructured titanium silicide interface for advanced photonic applications

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.
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.

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Organisations: Department of Physics, Research area: Aerosol Physics
Authors: Arffman, A.
Number of pages: 57
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Awarding institution:Tampere University of Technology
Research output: Collection of articles › Doctoral Thesis

**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.

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Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Research group: Laboratory for Future Electronics, Research group: Nanophotonics
Authors: Hakkarainen, T., Tommila, J., Schramm, A., Simonen, J., Niemi, T., Strelow, C., Kipp, T., Kontio, J., Guina, M.
Number of pages: 4
Pages: 139-142
Publication date: 2 Feb 2016
Exact modeling of finite temperature and quantum delocalization effects on reliability of quantum-dot cellular automata

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

General information
State: Published
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Publication date: 2016
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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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Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Tukiainen, A., Aho, A., Polojärvi, V., Ahorinta, R., Guina, M.
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Scopus rating (2015): SJR 0.174 SNIP 0.454 CiteScore 0.42
Scopus rating (2014): SJR 0.125 SNIP 0.187 CiteScore 0.25
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 sub-strates. 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 GaInNASb-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/GaInNASb triple-junction solar cells. Secondly, the use of a variety of electro-optical simulation tools such as Crosslight APSYS, Silvaco TCAD, PC1D, Es-ential 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 param-eters such as carrier lifetimes, mobilities and concentrations for dilute nitrides by matching the simula-tions to experimental solar cell device characteristics [3]. The extracted parameters are used for refin-ing 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/GaInNASb 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 concen-trated 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 em-ployed for solar cell photon management. The consequences of adding such elements to the fabrica-tion process and impact on improving the conversion efficiency towards >50% efficiency are as-sessed.

Influence of age-precipitation of Nb-Ti stabilized FeCr alloy on the initial stages of oxide film formation at 650 °C

General information
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Organisations: Optoelectronics Research Centre, Research group: Surface Science, MAX IV Laboratory, Lund University
Authors: Ali-Löytty, H., Hannula, M., Niu, Y., Zakharov, A., Valden, M.
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Event: Paper presented at Optics and Photonics days, Tampere, Finland.
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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
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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.
Number of pages: 2
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Research output: Professional › Commissioned report

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
Links:
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
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Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Research group: Laboratory for Future Electronics, Department of Physics, Research group: Nanophotonics
Authors: Hakkarainen, T., Tommila, J., Schramm, A., Simonen, J., Niemi, T., Strelow, C., Kipp, T., Kontio, J., Guina, M.
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Transformation of ALD grown TiO2 film to topographically microstructured titanium silicide for photonics applications

General information
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Organisations: Optoelectronics Research Centre, Research group: Surface Science, Research group: Nanophotonics
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https://www.maxlab.lu.se/cmis/display?id=workspace%3A%2F%2FSpacesStore%2F80e2da54-8373-4d0c-a4af-8b53b81b0ca3
Links:
https://www.maxlab.lu.se/node/2032#I311-PEEM_ (Reports 2015 - Syncrotron Radiation)
Research output: Professional › Commissioned report

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

General information
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Organisations: Optoelectronics Research Centre, Research group: Surface Science
Authors: Ali-Löytty, H., Valden, M.
Number of pages: 1
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Publication date: 2016
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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
Peer-reviewed: Yes
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.

General information
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Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research group: Quantum Control and Dynamics, Computational Science X (CompX), Austrian Acad Sci, Austrian Academy of Sciences, Johann Radon Inst Computat & Appl Math
Authors: Kylänpää, I., Aichinger, M., Janecek, S., Räsänen, E.
Number of pages: 7
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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.

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Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics, VTT Technical Research Centre of Finland
Authors: Tukiainen, A., Likonen, J., Toikkanen, L., Leinonen, T.
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Peer-reviewed: Yes

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Scopus rating (2014): SJR 0.795 SNIP 1.184 CiteScore 1.69
Scopus rating (2013): SJR 0.831 SNIP 1.221 CiteScore 1.78
Scopus rating (2012): SJR 0.956 SNIP 1.246 CiteScore 1.68
Scopus rating (2011): SJR 0.96 SNIP 1.425 CiteScore 1.89
Scopus rating (2010): SJR 1.163 SNIP 1.206
Scopus rating (2009): SJR 1.068 SNIP 1.202
Scopus rating (2008): SJR 1.161 SNIP 1.236
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.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Computational Physics, Max-Planck Institute for the Physics of Complex Systems, Institute for Physics and Astronomy, University of Potsdam, Nordic Institute for Theoretical Physics NORDITA, Shahid Beheshti University, Kharkov Institute of Physics and Technology
Authors: Safdari, H., Chechkin, A. V., Jafari, G. R., Metzler, R.
Publication date: 7 Apr 2015
Peer-reviewed: Yes

Publication information
Journal: Physical Review E
Volume: 91
Issue number: 4
Article number: 042107
ISSN (Print): 1539-3755

Ratings:

Scopus rating (2016): SJR 0.993 SNIP 0.896 CiteScore 1.95
Scopus rating (2015): SJR 1.047 SNIP 0.978 CiteScore 1.89
Scopus rating (2014): SJR 1.22 SNIP 1.123 CiteScore 2.05
Scopus rating (2013): SJR 1.311 SNIP 1.239 CiteScore 2.28
Scopus rating (2012): SJR 1.42 SNIP 1.226 CiteScore 2.28
Scopus rating (2011): SJR 1.485 SNIP 1.225 CiteScore 2.28
Scopus rating (2010): SJR 1.69 SNIP 1.215
Scopus rating (2009): SJR 1.694 SNIP 1.259
Scopus rating (2008): SJR 1.96 SNIP 1.314
Scopus rating (2007): SJR 1.926 SNIP 1.332
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.
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

Publication information
Journal: Physical Review B
Volume: 91
Issue number: 11
Article number: 115305
ISSN (Print): 1098-0121
Ratings:
Scopus rating (2016): CiteScore 3.16 SJR 1.939 SNIP 1
Scopus rating (2015): SJR 1.943 SNIP 1.008 CiteScore 2.8
Scopus rating (2014): SJR 2.656 SNIP 1.302 CiteScore 3.3
Scopus rating (2013): SJR 2.804 SNIP 1.348 CiteScore 3.55
Scopus rating (2012): SJR 3.159 SNIP 1.397 CiteScore 3.57
Scopus rating (2011): SJR 3.306 SNIP 1.433 CiteScore 3.61
Scopus rating (2010): SJR 3.303 SNIP 1.45
Scopus rating (2009): SJR 3.116 SNIP 1.467
Scopus rating (2008): SJR 2.949 SNIP 1.525
Scopus rating (2007): SJR 2.925 SNIP 1.609
Scopus rating (2006): SJR 2.799 SNIP 1.56
Scopus rating (2005): SJR 2.748 SNIP 1.587
Scopus rating (2004): SJR 2.718 SNIP 1.583
Scopus rating (2003): SJR 2.71 SNIP 1.512
Scopus rating (2002): SJR 2.782 SNIP 1.704
Scopus rating (2001): SJR 2.968 SNIP 1.648
Scopus rating (2000): SJR 2.979 SNIP 1.629
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.
Fabrication and characterization of superluminescent diodes for 2–3 µm wavelength

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre, Research group: Nanophotonics, Research group: Semiconductor Technology and Applications, Optoelectronics Research Centre, Tampere University of Technology
Authors: Zia, N., Viheriälä, J., Koskinen, R., Koskinen, M., Suomalainen, S., Guina, M.
Publication date: 2015

Host publication information
Title of host publication: Northern Optics and Photonics 2015: June 2-4, 2015, Lappeenranta
Research output: Scientific › Conference contribution

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.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Computational Physics
Authors: Shin, J., Cherstvy, A. G., Kim, W. K., Metzler, R.
Pages: 113008
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: New Journal of Physics
Volume: 17
Issue number: 11
ISSN (Print): 1367-2630
Ratings:
Scopus rating (2016): SJR 1.788 SNIP 1.031 CiteScore 2.97
Scopus rating (2015): SJR 1.938 SNIP 1.047 CiteScore 2.8
Scopus rating (2014): SJR 2.806 SNIP 1.307 CiteScore 2.89
Scopus rating (2013): SJR 2.871 SNIP 1.372 CiteScore 2.77
Scopus rating (2012): SJR 3.352 SNIP 1.533 CiteScore 3.4
Scopus rating (2011): SJR 3.47 SNIP 1.634 CiteScore 3.99
Scopus rating (2010): SJR 3.395 SNIP 1.421
Scopus rating (2009): SJR 3.215 SNIP 1.503
Scopus rating (2008): SJR 2.913 SNIP 1.396
Scopus rating (2007): SJR 2.825 SNIP 1.354
Scopus rating (2006): SJR 2.2 SNIP 1.296
Scopus rating (2005): SJR 1.641 SNIP 1.116
Scopus rating (2004): SJR 1.211 SNIP 1.009
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 structures, 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
Publication date: 2015

Host publication information
Volume: 9383
Publisher: SPIE
Article number: 93830E
ISBN (Print): 9781628414738
Keywords: high-index surface, light-emitting diode, tensile strained barrier
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.
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:
Scopus rating (2016): SJR 0.951 SNIP 1.225 CiteScore 3.37
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
Keywords: Liquid flame spray, Corrosion, Corrosion protection, Carbon steel, Plasma coating, Impedance spectroscopy
DOIs:
10.1016/j.apsusc.2015.09.238
Links:
Source: RIS
Source-ID: urn:DEEABDDCBAC729637D296E29C27BE21
Research output: Scientific - peer-review › Article

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
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 \( \sim 1500 \) 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.
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.

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
Publication date: 13 Dec 2014
Peer-reviewed: Yes

Publication information
Journal: Nanoscale Research Letters
Volume: 9
Issue number: 1
Article number: 657
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
Scopus rating (2010): SJR 1.062 SNIP 1.007
Scopus rating (2009): SJR 1.063 SNIP 1.01
Scopus rating (2008): SJR 0.828 SNIP 0.632
Scopus rating (2007): SJR 1.458 SNIP 0.71
Original language: English
Keywords: Lasers, Microcavities, Microdisks, Microrings, Semiconductor quantum dots
ASJC Scopus subject areas: Materials Science(all), Condensed Matter Physics
DOI: 10.1186/1556-276X-9-657
Source: Scopus
Source-ID: 84938392488

Research output: Scientific - peer-review › Article
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: Scopus rating (2016): SJR 1.096 SNIP 0.814 CiteScore 2.87
Scopus rating (2015): SJR 1.18 SNIP 0.966 CiteScore 3.07
Scopus rating (2014): SJR 1.465 SNIP 1.258 CiteScore 3.09
Scopus rating (2013): SJR 1.585 SNIP 1.244 CiteScore 2.74
Scopus rating (2012): SJR 1.846 SNIP 1.306 CiteScore 3.34
Scopus rating (2011): SJR 1.892 SNIP 1.461 CiteScore 3.86
Scopus rating (2010): SJR 1.844 SNIP 1.259
Scopus rating (2009): SJR 1.819 SNIP 1.28
Scopus rating (2008): SJR 1.875 SNIP 1.333
Scopus rating (2007): SJR 1.91 SNIP 1.36
Scopus rating (2006): SJR 1.934 SNIP 1.378
Scopus rating (2005): SJR 1.925 SNIP 1.445
Scopus rating (2004): SJR 1.849 SNIP 1.477
Scopus rating (2003): SJR 1.427 SNIP 1.371
Scopus rating (2002): SJR 0.962 SNIP 0.993
Scopus rating (2001): SJR 0.901 SNIP 0.94
Scopus rating (2000): SJR 0.881 SNIP 0.891
Scopus rating (1999): SJR 1.131 SNIP 0.953
Original language: English
DOIs: 10.1088/0957-4484/25/43/435603

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-10-17<br/>Publisher name: Institute of Physics
Source: researchoutputwizard
Source-ID: 1773
Research output: Scientific - peer-review › Article

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
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:
Scopus rating (2016): SJR 0.951 SNIP 1.225 CiteScore 3.37
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
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
Contribution: organisation=orc,FACT1=1
Portfolio EDEND: 2014-12-31
Publisher name: Elsevier
Source-ID: 1772
Research output: Scientific - peer-review › Article

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
Volume: 90
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

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-12-08<br/>Publisher name: American Physical Society
Source: researchoutputwizard
Source-ID: 1405
Research output: Scientific - peer-review › Article

Dirac physics in flakes of artificial graphene in magnetic fields

General information
High-Energy Anomaly in the Angle-resolved Photoemission spectra of Nd$_{2-x}$Ce$_x$CuO$_4$: Evidence for a Matrix Element Effect

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Spectroscopies of Complex Materials, Department of Physics, Computational Science X (CompX)
Authors: Rienks, E., Årräätä, M., Lindroos, M., Roth, F., Tabis, W., Yu, G., Greven, M., Fink, J.
Number of pages: 5
Pages: 1-5
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Physical Review Letters
Volume: 113
Article number: 137001
ISSN (Print): 0031-9007
Ratings:
Scopus rating (2016): SJR 3.56 SNIP 2.133 CiteScore 6.33
Scopus rating (2015): SJR 3.823 SNIP 2.205 CiteScore 5.76
Scopus rating (2014): SJR 5.027 SNIP 2.646 CiteScore 6.62
Scopus rating (2013): SJR 5.674 SNIP 2.796 CiteScore 7.46
Scopus rating (2012): SJR 6.243 SNIP 2.845 CiteScore 7.19
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
Scopus rating: 2016: SJR 0.632 SNIP 0.815 CiteScore 1.72
Scopus rating: 2015: SJR 0.618 SNIP 0.84 CiteScore 1.57
Scopus rating: 2014: SJR 1.005 SNIP 1.18 CiteScore 2.04
Scopus rating: 2013: SJR 1.165 SNIP 1.317 CiteScore 2.24
Scopus rating: 2012: SJR 1.305 SNIP 1.294 CiteScore 2.13
Scopus rating: 2011: SJR 1.373 SNIP 1.318 CiteScore 2.24
Scopus rating: 2010: SJR 1.47 SNIP 1.195
Scopus rating: 2009: SJR 1.518 SNIP 1.238
Scopus rating: 2008: SJR 1.667 SNIP 1.338
Scopus rating: 2007: SJR 1.708 SNIP 1.395
Scopus rating: 2006: SJR 1.947 SNIP 1.649
Scopus rating: 2005: SJR 2.034 SNIP 1.627
Scopus rating: 2004: SJR 2.097 SNIP 1.602
Scopus rating: 2003: SJR 2.019 SNIP 1.525
Scopus rating: 2002: SJR 2.225 SNIP 1.674
Scopus rating: 2001: SJR 2.079 SNIP 1.554
Influence of surface hydroxylation on the oxidation of FeCr in O2 and air

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: Hirsimäki, M., Hannula, M., Lahtonen, K., Urpelainen, S., Valden, M.
Number of pages: 2
Pages: 1-2
Publication date: 2014

Host publication information
Title of host publication: Max-Lab Activity Report 2013. Reports 2013 Synchrotron Radiation. Beamline I511-1
Place of publication: Lund, Sweden
Publisher: MAX-LAB
Links:
https://www.maxlab.lu.se/node/1913

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., Polojärvi, 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
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
Volume: 87
Issue number: 6
Article number: 144
ISSN (Print): 1434-6028
Ratings:
Scopus rating (2016): SJR 0.452 SNIP 0.654 CiteScore 1.11
Scopus rating (2015): SJR 0.53 SNIP 0.744 CiteScore 1.13
Scopus rating (2014): SJR 0.657 SNIP 0.717 CiteScore 1.25
Scopus rating (2013): SJR 0.727 SNIP 0.805 CiteScore 1.42
Scopus rating (2012): SJR 0.851 SNIP 0.886 CiteScore 1.51
Scopus rating (2011): SJR 1.027 SNIP 0.924 CiteScore 1.6
Scopus rating (2010): SJR 1.087 SNIP 0.871
Scopus rating (2009): SJR 0.973 SNIP 0.815
Scopus rating (2008): SJR 1.099 SNIP 0.837
Scopus rating (2007): SJR 1.158 SNIP 0.933
Scopus rating (2006): SJR 1.146 SNIP 0.933
Scopus rating (2005): SJR 1.305 SNIP 0.958
Scopus rating (2004): SJR 1.3 SNIP 0.928
Scopus rating (2003): SJR 1.297 SNIP 0.856
Scopus rating (2002): SJR 1.396 SNIP 1.06
Scopus rating (2001): SJR 1.497 SNIP 1.025
Scopus rating (2000): SJR 1.843 SNIP 1.394
Scopus rating (1999): SJR 1.648 SNIP 1.156
Original language: English
DOIs:
10.1140/epjb/e2014-50224-0
Links:

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-09-30<br/>Publisher name: Springer
Source: researchoutputwizard
Source-ID: 1032
Research output: Scientific - peer-review › Article

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)
Structure and dynamics in liquid bismuth and Bi 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:
Scopus rating (2016): CiteScore 2.13 SJR 1.073 SNIP 0.755
Scopus rating (2015): SJR 0.953 SNIP 0.767 CiteScore 1.98
Scopus rating (2014): SJR 1.386 SNIP 0.989 CiteScore 2.54
Scopus rating (2013): SJR 1.532 SNIP 1.17 CiteScore 2.95
Scopus rating (2012): SJR 1.787 SNIP 1.118 CiteScore 2.86
Scopus rating (2011): SJR 1.805 SNIP 1.207 CiteScore 3.07
Scopus rating (2010): SJR 1.73 SNIP 1.052
Scopus rating (2009): SJR 2.003 SNIP 1.104
Scopus rating (2008): SJR 2.189 SNIP 1.12
Scopus rating (2007): SJR 2.163 SNIP 1.108
Scopus rating (2006): SJR 2.176 SNIP 1.266
Scopus rating (2005): SJR 2.27 SNIP 1.359
Scopus rating (2004): SJR 2.229 SNIP 1.369
Scopus rating (2003): SJR 2.121 SNIP 1.322
Scopus rating (2002): SJR 2.256 SNIP 1.341
Scopus rating (2001): SJR 2.381 SNIP 1.362
Scopus rating (2000): SJR 2.576 SNIP 1.423
Scopus rating (1999): SJR 2.133 SNIP 1.419
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:
Scopus rating (2016): CiteScore 3.16 SJR 1.939 SNIP 1
Scopus rating (2015): SJR 1.943 SNIP 1.008 CiteScore 2.8
Scopus rating (2014): SJR 2.656 SNIP 1.302 CiteScore 3.3
Scopus rating (2013): SJR 2.804 SNIP 1.348 CiteScore 3.55
Scopus rating (2012): SJR 3.159 SNIP 1.397 CiteScore 3.57
Scopus rating (2011): SJR 3.306 SNIP 1.433 CiteScore 3.61
Scopus rating (2010): SJR 3.303 SNIP 1.45
Scopus rating (2009): SJR 3.116 SNIP 1.467
Scopus rating (2008): SJR 2.949 SNIP 1.525
Scopus rating (2007): SJR 2.925 SNIP 1.609
Scopus rating (2006): SJR 2.799 SNIP 1.56
Scopus rating (2005): SJR 2.748 SNIP 1.587
Scopus rating (2004): SJR 2.718 SNIP 1.583
Scopus rating (2003): SJR 2.71 SNIP 1.512
Scopus rating (2002): SJR 2.782 SNIP 1.704
Scopus rating (2001): SJR 2.968 SNIP 1.648
Scopus rating (2000): SJR 2.979 SNIP 1.629
Scopus rating (1999): SJR 3.077 SNIP 1.588
Original language: English
DOIs:
10.1103/PhysRevB.89.064202

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-12-17<br/>Publisher name: American Physical Society
Source: researchoutputwizard
Source-ID: 77
Research output: Scientific - peer-review › Article
Surface Modifications and Analysis Methods at Molecular Level

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Department of Physics, Research group: Ultrafast and intense lasers, Research group: Nanophotonics
Publication date: 2014

Host publication information
Title of host publication: Abstracts of the 28th International Conference on Surface Modification Technologies, SMT28, Tampere University of Technology, Tampere, Finland, June 16-18, 2014
Place of publication: Tampere
Publisher: Tampere University of Technology
Links:

Bibliographical note
Research output: Scientific - peer-review › Conference contribution

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., Kruusma, J., Pärna, R., Kikas, A., Hirsimäki, M., Nommiste, E., Lust, E.
Number of pages: 10
Pages: A1084-A1093
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of the Electrochemical Society
Volume: 160
Issue number: 8
ISSN (Print): 0013-4651
Ratings:
Scopus rating (2016): SJR 1.134 SNIP 0.867 CiteScore 2.97
Scopus rating (2015): SJR 1.037 SNIP 1 CiteScore 3.17
Scopus rating (2014): SJR 1.147 SNIP 1.206 CiteScore 3.36
Scopus rating (2013): SJR 1.151 SNIP 1.299 CiteScore 2.92
Scopus rating (2012): SJR 1.329 SNIP 1.296 CiteScore 2.61
Scopus rating (2011): SJR 1.33 SNIP 1.345 CiteScore 2.74
Scopus rating (2010): SJR 1.417 SNIP 1.312
Scopus rating (2009): SJR 1.45 SNIP 1.267
Scopus rating (2008): SJR 1.608 SNIP 1.416
Scopus rating (2007): SJR 1.58 SNIP 1.325
Scopus rating (2006): SJR 1.611 SNIP 1.54
Scopus rating (2005): SJR 1.519 SNIP 1.484
Scopus rating (2004): SJR 1.719 SNIP 1.706
Scopus rating (2003): SJR 1.962 SNIP 1.679
Scopus rating (2002): SJR 2.147 SNIP 1.646
Scopus rating (2001): SJR 1.651 SNIP 1.738
Optimization of interfacial oxidation properties of FeCr SOFC interconnect alloy

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: Ali-Löytty, H., Jussila, P., Hirsimäki, M., Välden, M.
Number of pages: 2
Pages: 1-2
Publication date: 2013

Host publication information
Place of publication: Lund, Sweden
Publisher: MAX-LAB
Links:
https://www.maxlab.lu.se/cmis/display?id=workspace%3A%2F%2FSpacesStore%2F0f1d8b0b-533a-48e6-a4cf-a85090776767
https://www.maxlab.lu.se/node/1693

Bibliographical note
Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2013-09-29<br/>Publisher name: Electrochemical Society
Source: researchoutputwizard
Source-ID: 3553
Research output: Scientific › Article

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
Article number: 050504
ISSN (Print): 0953-8984
Ratings:
Scopus rating (2016): CiteScore 1.89 SJR 0.881 SNIP 0.754
Scopus rating (2015): SJR 0.824 SNIP 0.754 CiteScore 1.65
Scopus rating (2014): SJR 1.217 SNIP 0.951 CiteScore 1.99
Scopus rating (2013): SJR 1.297 SNIP 1.022 CiteScore 2.11
Scopus rating (2012): SJR 1.659 SNIP 1.166 CiteScore 2.33
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:
Scopus rating (2016): SJR 0.452 SNIP 0.654 CiteScore 1.11
Scopus rating (2015): SJR 0.53 SNIP 0.744 CiteScore 1.13
Scopus rating (2014): SJR 0.657 SNIP 0.717 CiteScore 1.25
Scopus rating (2013): SJR 0.727 SNIP 0.805 CiteScore 1.42
Scopus rating (2012): SJR 0.851 SNIP 0.886 CiteScore 1.51
Scopus rating (2011): SJR 1.027 SNIP 0.924 CiteScore 1.6
Scopus rating (2010): SJR 1.087 SNIP 0.871
Scopus rating (2009): SJR 0.973 SNIP 0.815
Scopus rating (2008): SJR 1.099 SNIP 0.837
Scopus rating (2007): SJR 1.158 SNIP 0.933
Scopus rating (2006): SJR 1.146 SNIP 0.933
Scopus rating (2005): SJR 1.305 SNIP 0.958
Scopus rating (2004): SJR 1.3 SNIP 0.928
Scopus rating (2003): SJR 1.297 SNIP 0.856
Scopus rating (2002): SJR 1.396 SNIP 1.06
Scopus rating (2001): SJR 1.497 SNIP 1.025
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., Käämbre, 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:
Scopus rating (2016): SJR 0.683 SNIP 0.849 CiteScore 1.69
Scopus rating (2015): SJR 0.688 SNIP 0.89 CiteScore 1.62
Scopus rating (2014): SJR 0.692 SNIP 0.901 CiteScore 1.56
Scopus rating (2013): SJR 0.772 SNIP 0.904 CiteScore 1.6
Scopus rating (2012): SJR 0.865 SNIP 0.929 CiteScore 1.53
Scopus rating (2011): SJR 0.964 SNIP 0.981 CiteScore 1.66
Scopus rating (2010): SJR 0.872 SNIP 0.794
Scopus rating (2009): SJR 0.918 SNIP 0.831
Scopus rating (2008): SJR 0.818 SNIP 0.791
Scopus rating (2007): SJR 1.003 SNIP 0.992
Scopus rating (2006): SJR 0.833 SNIP 0.791
Scopus rating (2005): SJR 0.776 SNIP 0.718
Scopus rating (2004): SJR 0.697 SNIP 0.632
Scopus rating (2003): SJR 0.832 SNIP 0.73
Scopus rating (2002): SJR 0.824 SNIP 0.806
Scopus rating (2001): SJR 0.824 SNIP 0.787
Scopus rating (2000): SJR 1.107 SNIP 0.914
Scopus rating (1999): SJR 0.866 SNIP 0.815
Original language: English
DOIs:
10.1002/pssa.201127641

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