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VERHANDLUNGEN

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3/2015

DPG-Frühjahrstagung 2015

(DPG Spring Meeting)

79th Annual Meeting of the DPG

and DPG-Frühjahrstagung of the Condensed Matter Section (SKM)

together with the Divisions
History of Physics
Gravitation and Relativity (together with the Astronomische Gesellschaft e. V.)
Microprobes
Theoretical and Mathematical Physics

and Working Groups
Energy
Equal Opportunities
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Philosophy of Physics
Physics and Disarmament
young DPG

Job Market
Symposia
Tutorials
Exhibition of Scientific Instruments and Literature

Berlin
March 15 – 20, 2015

INTERNATIONAL YEAR OF LIGHT 2015

HL 44.12 Wed 12:30 EW 203

Strain in colloidal CdSe/CdS core/shell nanocrystals — •Narine Ghazarian[1], Amelie Biermann[1], Tangi Aubert[2], Marco Cirillo[2], Andrei Schliwa[1], Zeger Hens[2], Janina Maultzsch[1], Axel Hoffmann[1], and Christian Thomsen[1] — [1]Institut für Festkörperphysik, Technische Universität Berlin, Germany — [2]Physics and Chemistry of Nanostructures, Ghent University, Belgium

H… …:30 ER 164

In situ Raman monitoring of silica shell forn… quantum dots — •Philipp Baumeister[1], … Aubert[2], Zeger Hens[2], Janina Maultzsch[1], … [1]Institut für Festkörperphysik, Technische Universi… [2]Physics and Chemistry of Nanostructures, Ghent Unive…

Semiconductor Physics

HL 45: Organic electronics and photovoltaics: OPV II (CPP with HL/TT)

Time: Wednesday 9:30–13:00 Location: C 130

See CPP 36 for details of this session.

HL 46: Graphene: Dynamics (O with HL/TT)

Time: Wednesday 10:30–13:00 Location: MA 041

See O 48 for details of this session.

HL 47: Frontiers of electronic structure theory: Organics and materials

Time: Wednesday 10:30–13:30 Location: MA 004

See O 47 for details of this session.

HL 48: Focus Session (with O): Nanophotonic concepts and materials for energy harvesting - Plasmonics, transformation optics, upconversion, and beyond I

Nanostructured and novel photonic materials can control the spectral composition of light, its propagation characteristics, and its interaction with matter. The use of these abilities is particularly rewarding in the context of energy harvesting in semi-conductor materials. This focused session appreciates and presents the most recent advancement in this field of research, where progress has been made from a conceptual but also from a materials perspective.

Organization: Carsten Rockstuhl (KIT, Karlsruhe), Jan Christoph Goldschmidt (FhG ISE, Freiburg), Ralf Wehrspohn (MLU Halle), Uli Lemmer (KIT, Karlsruhe)

Time: Wednesday 11:00–13:00 Location: EW 201

Invited Talk HL 48.1 Wed 11:00 EW 201

Transformation Optics: From Fundamentals to Applications for Energy Harvesting — •Martin Wegener and Martin Schumann — Institute of Applied Physics and Institute of Nanotechnology, Karlsruhe Institute of Technology, 76128 Karlsruhe, Germany

Transformation optics can be seen as a versatile tool for designing devices in optics and other areas of physics. In this talk, we start by giving a broad introduction into this concept. A striking paradigm is invisibility cloaking. We briefly review experimental demonstrations in optics, thermodynamics, and mechanics. Next, we discuss a possible application: In order to extract the electrical power from solar cells, metal contacts at the sun-facing surface are required. Unfortunately, these contacts create optically dead areas, reducing the overall current per area by a few percent. We present a solution to this problem by using microstructures that are designed by transformation optics and that cloak the contacts. An experimental proof-of-principle demonstration based on three-dimensional direct-laser-writing optical laser lithography is given.

Invited Talk HL 48.2 Wed 11:30 EW 201

Nanostructures and materials for intermediate band solar cells — •Antonio Martí — Instituto de Energía Solar, ETSI Telecomunicación, Universidad Politécnica de Madrid

Intermediate band solar cells (IBSCs) seek for materials that can harvest photons with energy lower than the semiconductor bandgap without degrading the output voltage of the cell. One of these material systems relies on the use of quantum dots (QDs). Under this approach, photons are harvested thanks to the energy states of the electrons confined in the quantum dots. In this contribution we review the theory that sustains the use of QDs for IBSC applications, the design constrains of these kind of solar cells, its limitations and challenges as well as the most recent experimental results. These experimental results refer to the empirical demonstration of the use of two below bandgap energy photons to generate an electron-hole pair and the preservation of the output voltage of the

HL 48.3 Wed 12:00 EW 201

Emission quenching of magnetic dipole transitions near an absorbing optical nanoantenna — •Dmitry Chigrin, Deepu Kumar, and Gero von Plessen — RWTH Aachen University, 52074 Aachen, Germany

HL 48.4 Wed 12:15 EW 201

Light trapping with combined photonic elements — •Aimi Abass[1] and Bjorn Maes[2,3] — [1]Institute of Nanotechnology, Karlsruhe Institute of Technology, 76021 Karlsruhe, Germany — [2]Photonics Research Group (INTEC), Ghent University-imec, Sint-Pietersnieuwstraat 41, B-9000 Ghent, Belgium — [3]Micro- and Nanophotonic Materials Group, Faculty of Science, University of Mons, 20 place du Parc, B-7000 Mons, Belgium

HL 48.5 Wed 12:30 EW 201

Tailoring Disorder of Nanophotonic Light-Trapping Concepts for Thin-Film Silicon Solar Cells — •Ulrich W. Paetzold[1], Karsten Bittkau[1], Y. J. Donie[2], Guillaume Goumard[2], Radwanul H. Siddique[2], Michael Smeets[1], Hendrik Hölscher[2], Reinhard Carius[1], Uwe Rau[1], and Uli Lemmer[2] — [1]IEK5 * Photovoltaik, Forschungszentrum Jülich GmbH, 52425 Jülich, Germany — [2]Light Technology Institute and Institute for Microstructure Technology, Karlsruhe Institute of Technology, Engesserstr. 13, 76131 Karlsruhe, Germany

HL 48.6 Wed 12:45 EW 201

Opaline Photonic Crystals as Back Side Reflector for Thin-Film Silicon Solar Cells — •Daniela Schneevoigt[1], Frederik Bub[1], Alexander N. Sprafke[1], Ralf B. Wehrspohn[1,2], André Hoffmann[3], Karsten Bittkau[3], Reinhard Carius[3], Samuel Wiesendanger[4], and Carsten Rockstuhl[5] — [1]Martin-Luther-Universität Halle-Wittenberg, Germany — [2]Fraunhofer IWM, Halle, Germany — [3]Forschungszentrum Jülich GmbH, Germany — [4]Friedrich-Schiller-Universität Jena, Germany — [5]Karlsruher Institut für Technologie, Germany

Contribution submission to the conference Berlin 2015

Light trapping with combined photonic elements — •Aimi Abass[1] and Bjorn Maes[2,3] — [1]Institute of Nanotechnology, Karlsruhe Institute of Technology, 76021 Karlsruhe, Germany — [2]Photonics Research Group (INTEC), Ghent University-imec, Sint-Pietersnieuwstraat 41, B-9000 Ghent, Belgium — [3]Micro- and Nanophotonic Materials Group, Faculty of Science, University of Mons, 20 place du Parc, B-7000 Mons, Belgium

Nanophotonics offers many avenues for enhancing solar cells. For example, one can tailor the incoming light flow to boost absorption via nanostructures. To ensure strong absorption over the whole spectral range of interest, one has to utilize many photonic phenomena. Oftentimes however, the nanoscale geometrical requirements for optimum excitation of one phenomenon can be at the expense of another. To address this challenge, we examine light trapping strategies with combined photonic elements and study conditions under which different elements complement each other. Here, we discuss the usage of dual interface gratings (DIGs) and diffuser-grating structures. The former enhances absorption by relying on guided mode excitation while the latter focuses on antireflection and scattering management. In such structures the responsibility of different optical components is split, enabling more flexibility in optimization. One main point of discussion is multiperiodic DIG systems, which provide a rich Fourier spectrum, while maintaining a straightforward geometry. In studying combined diffuser-grating structures, we developed a memory efficient calculation method, which evades dealing with rough diffuser geometries directly.

Part:	**HL**
Type:	**Post-Deadline-Vortrag;Post Deadline Talk**
Topic:	**Post-deadline-Beiträge; Post-deadline contributions**
Email:	**aimiabass@gmail.com**