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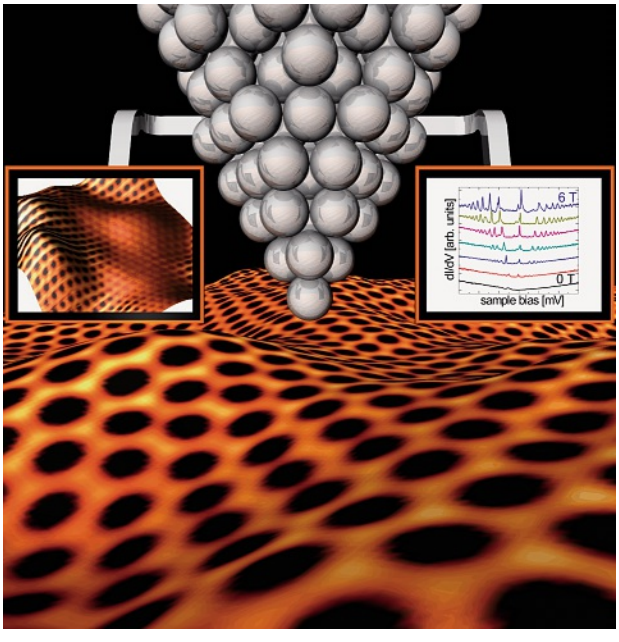
COVER PICTURE

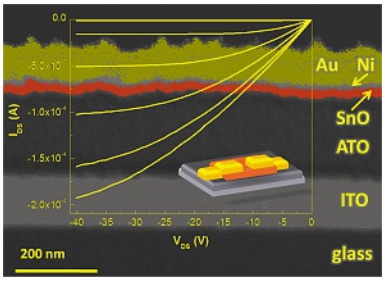


Graphene (the single atomic layer of carbon atoms, exhibiting hexagonal atomic lattice and a linear electronic band structure around the Fermi level) provides exceptional properties such as extremely large room-temperature electron mobility, elastic constant, breaking strength, and a transparency of 97%, which has high potential for applications. In fact, strong efforts are being made to realize displays based on graphene as a transparent electrode. High-frequency transistors that take advantage of the large mobility of graphene are under way, same as are tunable optical absorbers that make use of the linear band structure. In his Feature Article (see pp. S57–S68 in this edition), Markus Morgenstern summarizes the most important findings on the electronic properties down to the atomic scale that were obtained by scanning tunneling microscopy: Deformations of the material on the nanometer scale mimicking nanodrums with extremely large resonance frequencies, as well as detailed mappings of the electronic structure under quantum Hall conditions. The latter targets a bottom-up approach to the phase diagram of interacting electrons. These results also show the controlled lifting of degeneracies by the breaking of different symmetries, and first signatures of electron–electron interaction on a local scale.

EDITORIAL

Page **S1–S2** **Stefan Hildebrandt**
Welcome to the future of solid state physics publishing

Page **S9–S12** ***Expert Opinion***
E. Fortunato and R. Martins
Where science fiction meets reality? With oxide semiconductors!
Phys. Status Solidi RRL **5**, 336–339 (2011)

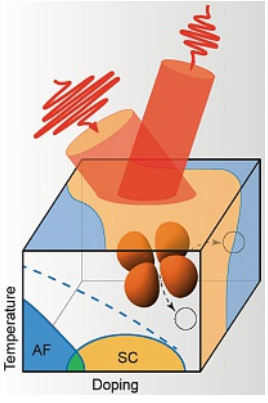


Transparent electronics has arrived and is contributing for generating a "free real estate" electronics that is able to add new electronic functionalities onto surfaces, which currently are not used in this manner and where silicon cannot compete. High performance p-type oxide thin film transistors (TFTs) on glass substrates using a reactive sputter deposited SnO_x channel layer have been fabricated. This breakthrough will enable the production of fully transparent complementary metal oxide semiconductor devices associated with all the main advantages offered by transparent/oxide electronics.

Page **S13–S21** _____ ***Review@RRL***
Elbert E. M. Chia, Jian-Xin Zhu, D. Talbayev, and A. J. Taylor

Competing energy scales in high-temperature superconductors: Ultrafast pump–probe studies

Phys. Status Solidi RRL **5**, 1–9 (2011)

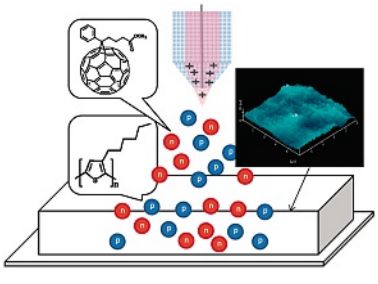


The complex puzzle of phases that can exist, co-exist, or compete in strongly correlated electron materials is among the greatest opportunities for progressing our understanding of solids state physics today. In this Review@RRL, the authors explain the insight that time-resolved spectroscopy brought for the study of photoexcited quasiparticle dynamics, discussing examples of cuprate and pnictide high-temperature superconductors in regimes where different phases such as superconductivity, spin-density-wave and pseudogap phases coexist or compete with one another.

Page **S22–S24**_____ **Takeshi Fukuda, Kenji Takagi, Takashi Asano, Zentaro Honda, Norihiko Kamata, Keiji Ueno, Hajime Shirai, Jungmyoung Ju, Yutaka Yamagata, and Yusuke Tajima**

Bulk heterojunction organic photovoltaic cell fabricated by the electrospray deposition method using mixed organic solvent

Phys. Status Solidi RRL **5**, 229–231 (2011)

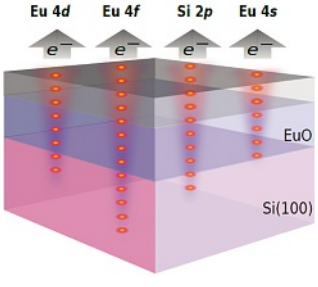


In this Letter, the authors demonstrate a novel solution process (electrospray deposition) for application in organic photovoltaics. The surface roughness was drastically reduced by controlling the evaporation speed of the solvent, so that a root mean square roughness of only 3.31 nm was obtained. In addition, the smooth surface causes an improved photovoltaic performance of the bulk hetero-junction device.

Page **S25–S27** _____ **C. Caspers, M. Müller, A. X. Gray, A. M. Kaiser, A. Gloskovskii, C. S. Fadley, W. Drube, and C. M. Schneider**

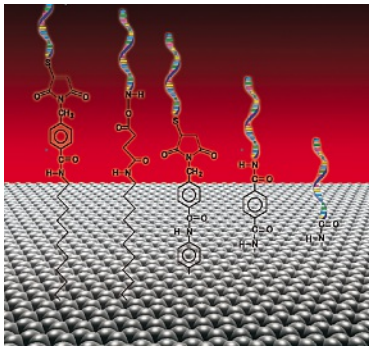
Electronic structure of EuO spin filter tunnel contacts directly on silicon

Phys. Status Solidi RRL **5**, 441–443 (2011)



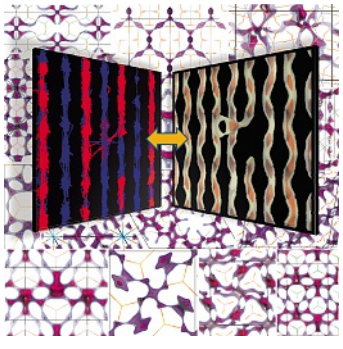
Hard X-ray photoemission spectroscopy reveals the nearly ideal stoichiometry of EuO spin filter tunnel barriers grown directly on silicon, and the absence of silicon oxide formation at the EuO/Si interface. These results demonstrate the successful integration of a magnetic oxide tunnel barrier with silicon, paving the way for the future integration of magnetic oxides into functional spintronics devices.

Page **S28–S39** *Feature Article*
H. Kawarada and A. R. Ruslinda
Diamond electrolyte solution gate FETs for DNA and protein sensors using DNA/RNA aptamers
Phys. Status Solidi A **208**, 2005–2018 (2011)



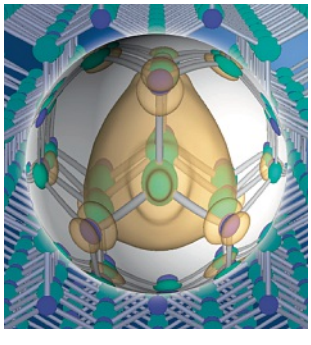
For DNA and protein detection, Kawarada and Ruslinda have analyzed DNA/RNA immobilized transistor-type biosensors based on diamond surfaces, where several types of atomic or molecule termination have been realized. Amine and carboxyl termination, substantial for biomolecule immobilization, can be formed directly on diamond surface. The immobilization of DNA/RNA is realized within 1–2 nm from the surface. The surface charge change caused by hybridization of DNA/RNA and the protein binding to the DNA/RNA aptamer can be efficiently detected.

Page **S40–S47** *Feature Article*
Stefan Adams and R. Prasada Rao
High power lithium ion battery materials by computational design
Phys. Status Solidi A **208**, 1746–1753 (2011)



Empirical bond length–bond valence relations provide insight into the link between structure of and ion transport in solid electrolytes and mixed conductors. Building on their earlier systematic adjustment of bond-valence (BV) parameters to the bond softness, Adams and Rao discuss how the squared BV mismatch is linked to the absolute energy scale and is used as a general Morse-type interaction potential for analyzing the low-energy ion migration paths in ion conducting solids or mixed conductors by either an energy landscape approach or molecular dynamics (MD) simulations.

Page **S48–S56** *Feature Article*
Chris G. Van de Walle and Anderson Janotti
Advances in electronic structure methods for defects and impurities in solids
Phys. Status Solidi B **248**, 19–27 (2011)



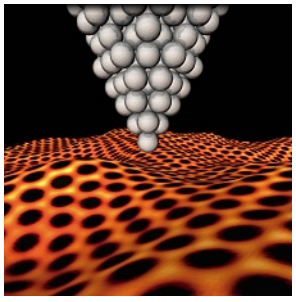
Van de Walle and Janotti review recent advances in the theory of defects in solids from the perspective of first-principles calculations. They focus in particular on methods that improve the description of band gaps, leading to results that can be directly compared to experiments on a quantitative level. The use of LDA+U in wide-band-gap materials is shown, as well as screened hybrid functionals, the quasiparticle GW method, and the use of modified pseudopotentials. Advantages and limitations of these methods are illustrated with examples.

Page **S57–S68**

Feature Article
Markus Morgenstern

Scanning tunneling microscopy and spectroscopy of graphene on insulating substrates

Phys. Status Solidi B **248**, 2423–2434 (2011)



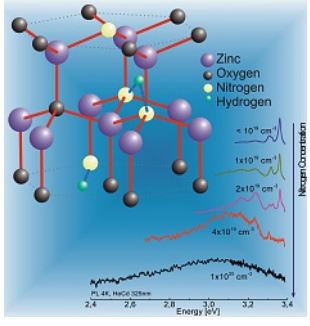
Scanning tunneling microscopy is a unique tool combining ultimate lateral resolution and excellent energy resolution. As such, it can reveal the electronic properties of materials in unprecedented detail. However, the requirement is that the material is conducting and exposed to a surface. Graphene is such a material with fascinating electronic properties which can now be imaged with μeV resolution down to the atomic scale. The current status of these investigations is reviewed in the Feature Article by Markus Morgenstern.

Page **S69–S73**

Editor's Choice
S. Lautenschlaeger, M. Hofmann, S. Eisermann, G. Haas, M. Pinnisch, A. Laufer, and B. K. Meyer

A model for acceptor doping in ZnO based on nitrogen pair formation

Phys. Status Solidi B **248**, 1217–1221 (2011)



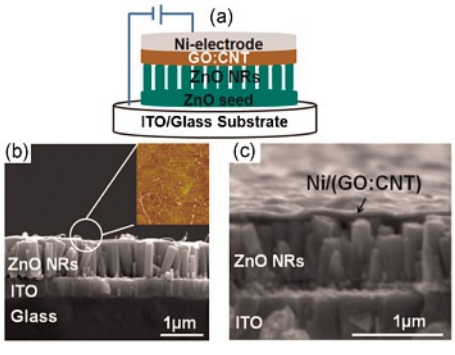
In this article, a complex model for shallow acceptors in ZnO, involving two group V acceptors (i.e., two nitrogen atoms) and one donor (in this case hydrogen), is presented and discussed. Three different nitrogen configurations are presented. One is the isolated N_O which might lead to deep acceptor states. The second configuration is the neutral N–H complex. The third one consists of an acceptor–donor–acceptor complex and may lead to the observed shallow acceptor. The authors discuss the photoluminescence data obtained by ammonia-doped samples with different amounts of N and H with respect to the acceptor model.

Page **S74–S77**

Tran Viet Cuong, Huynh Ngoc Tien, Van Hoang Luan, Viet Hung Pham, Jin Suk Chung, Dae Hwang Yoo, Sung Hong Hahn, Kee-Kahb Koo, Paul A. Kohl, Seung Hyun Hur, and Eui Jung Kim

Solution-processed semitransparent p–n graphene oxide:CNT/ZnO heterojunction diodes for visible-blind UV sensors

Phys. Status Solidi A **208**, 943–946 (2011)

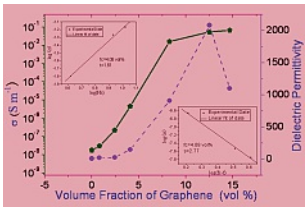


A transparent p–n heterojunction device composed of a vertical array of ZnO nanorods (NRs) and a very thin graphene oxide/carbon nanotube (GO : CNT) hybrid film was fabricated through a solution based process. Optical measurements reveal that the UV absorption of the ZnO NRs increased after a GO : CNT hybrid film was spray-coated onto the NRs. As a result, the device exhibits a high response to UV illumination. The fabricated p–n diode displays high rectifying characteristics and acts as an excellent visible-blind UV sensor. It is expected that heterostructures of 1D arrays and 2D carbon-based nanomaterials can provide new design opportunities in transparent optoelectronic devices.

Page **S78–S80** **Lili Cui, Xiaofeng Lu, Danming Chao, Hongtao Liu, Yongxin Li, and Ce Wang**

Graphene-based composite materials with high dielectric permittivity via an *in situ* reduction method

Phys. Status Solidi A **208**, 459–461 (2011)

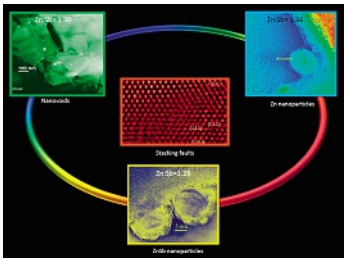


Cui et al. fabricated a novel composite with high dielectric permittivity containing poly(vinylidene fluoride) (PVDF) and graphene nanosheet by an in situ reduction approach. The composite film exhibited a lower percolation threshold of 4.08 vol% and a high dielectric permittivity of 2080 at 1000 Hz with 12.5 vol% of graphene fillers.

Page **S81–S86** **Protima Rauwel, Ole Martin Løvvik, Erwan Rauwel, Eric S. Toberer, G. Jeffrey Snyder, and Johan Taftø**

Nanostructuring in β-Zn_4Sb_3 with variable starting Zn compositions

Phys. Status Solidi A **208**, 1652–1657 (2011)

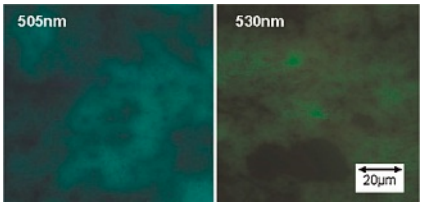


Nanostructuring in thermoelectric β-Zn_4Sb_3 has been observed by Rauwel et al. A variation in the Zn : Sb ratio brings about a phase separation not only at the microscale but also at the nanoscale. Through the technique of electron microscopy, the authors have been able to qualify the phase separation at both scales. Depending on the Zn : Sb ratio nanoprecipitation of ZnSb, nanovoids, or nanoprecipitation of Zn occurs. Stacking faults are also present for very high starting Zn contents.

Page **S87–S92** **Uwe Strauß, Adrian Avramescu, Teresa Lermer, Désirée Queren, Alvaro Gomez-Iglesias, Christoph Eichler, Jens Müller, Georg Brüderl, and Stephan Lutgen**

Pros and cons of green InGaN laser on c-plane GaN

Phys. Status Solidi B **248**, 652–657 (2011)

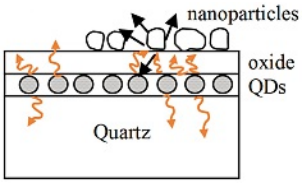


Green InGaN lasers are possible on different types of substrate polarities. On *c*-plane GaN substrate (contrary to nonpolar or semipolar substrates), a compromise has to be found between thick quantum wells with low indium content on one side and stronger e–h overlap on the other side. However, best device performance of 520 nm cw InGaN lasers is achieved on *c*-plane GaN.

Page **S93–S96** **Supriya Pillai, Ivan Perez-Wurfl, Gavin J. Conibeer, and Martin A. Green**

Surface plasmons for improving the performance of quantum dot structures for third generation solar cell applications

Phys. Status Solidi C **8**, 181–184 (2011)



Pillai et al. investigate the effect of surface plasmons on the emission from a single-layer quantum dot (QD) structure. Silver metal nanoparticles are tailored to provide selective scattering by varying size. The energy transfer between nanocrystal excitons and surface plasmons is tunable and can increase the absorption in bandgap engineered QD cells.

More to read

Reviews@RRL

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Thorsten Trupke, Jørgen Nyhus, and Jonas Haunschild, Phys. Status Solidi RRL **5**, 131 (2011)

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Takeshi Tanaka, Huaping Liu, Shunjiro Fujii, and Hiromichi Kataura, Phys. Status Solidi RRL **5**, 301 (2011)

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Armin Reller, Phys. Status Solidi RRL **5**, 309 (2011)

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Walter R. L. Lambrecht, Phys. Status Solidi B **248**, 1547 (2011)

Rapid Research Letter

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Review Article

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Feature Articles

Novel multifunctional materials based on oxide thin films and artificial heteroepitaxial multilayers
Matthias Opel, Stephan Geprägs, Edwin P. Menzel, Andrea Nielsen, Daniel Reisinger, Karl-Wilhelm Nielsen, Andreas Brandlmaier, Franz D. Czeschka, Matthias Althammer, Mathias Weiler, Sebastian T. B. Goennenwein, Jürgen Simon, Matthias Svete, Wentao Yu, Sven-Martin Hühne, Werner Mader, and Rudolf Gross, Phys. Status Solidi A **208**, 232 (2011)

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Spin transport and magnetoresistance in organic semiconductors
Wiebe Wagemans and Bert Koopmans, Phys. Status Solidi B **248**, 1029 (2011)

Editor's Choice

Creation of colour centres in diamond by collimated ion-implantation through nano-channels in mica
S. Pezzagna, D. Rogalla, H.-W. Becker, I. Jakobi, F. Dolde, B. Naydenov, J. Wrachtrup, F. Jelezko, C. Trautmann, and J. Meijer, Phys. Status Solidi A **208**, 2017 (2011)

Original Paper

$Mn_{3-x}Ga$ ($0 \le x \le 1$): Multifunctional thin film materials for spintronics and magnetic recording
H. Kurt, K. Rode, M. Venkatesan, P. Stamenov, and J. M. D. Coey, Phys. Status Solidi B **248**, 2338 (2011)

Invited Articles

Laser induced cooling of solids
Raman Kashyap and Galina Nemova, Phys. Status Solidi C **8**, 144 (2011)

Mesoporous silicon particles as intravascular drug delivery vectors: fabrication, in-vitro, and in-vivo assessments
Ciro Chiappini, Ennio Tasciotti, Rita E. Serda, Lou Brousseau, Xuewu Liu, and M. Ferrari, Phys. Status Solidi C **8**, 1826 (2011)