SCIENCE FORUM ON NANOTECHNOLOGY

MAY 27, 2009

БАДЕН-
ВЮРТЕМБЕРГ

25-28 МАЯ 09
В МОСКВЕ

BADEN-
WÜRTTEMBERG

25-28 MAI 09
IN MOSKAU

Science Forum on Nanotechnology

May 27, 2009, 09.00–17.30

House of the
Moscow City Government
Novy Arbat 36/9
121205 Moscow
Russian Federation

www.bwtage-moskau.de

PROGRAMME

09:00 – 09:30 Registration of participants
Opportunity to visit the exhibition "Baden-Württemberg – Land of Innovations"

09:30 – 10:00 **Opening remarks**

Dr. Dietrich Birk MdL, Parliamentary Secretary in the Ministry of Science, Research and the Arts Baden-Württemberg

Representative of the Moscow City Government

10:00 – 11.15 **Introductional reports**

– **Nanoscience in Baden-Württemberg – from nanomaterials to nanodevices**
Prof. Dr. Thomas Schimmel
Spokesman of the Kompetenznetz "Funktionelle Nanostrukturen" (Network of Excellence on Functional Nanostructures), Universität Karlsruhe (TH) and Forschungszentrum Karlsruhe

– **Nanotechnology in Russia/Moscow**
Dr. Anatoly Chubais (tbc)
Chief Executive Officer, Russian Cooperation of Nanotechnologies

– **Converging nano-, bio-, info- and cognitive-technologies**
Prof. Mikhail Kovalchuk
Director, Russian Research Center "Kurchatov Institute"

11:15 – 12:05 **Nanoelectronics and Nanooptics**

– **Nano-opto-mechanics: laser-induced mechanical effects in nanostructures**
Prof. Dr. Paul Leiderer
Head of Chair of Surface and Low-Temperature Physics, University of Konstanz

– **"Selective change of atomic composition" of thin-film materials for creation functional nanostructures for various application**
Dr. Boris Gurovich
Director of Institute for Reactor Technologies and Materials, Russian Research Center "Kurchatov Institute"

12:05 – 12:55 **Nanomaterials and Nanoparticles**

– **Technology transfer – from nano-analytics to nano-magnetism**
Prof. Dr. Günter Schatz
Director, Nanozentrum Euregio Bodensee (NEB) and Steinbeis Center for Technology Transfer "Nanostructures and Solid State-Analysis", University of Konstanz

– **Nanostructurization of materials for atomic energetic**
Prof. Yaroslav Shtrombakh
First Deputy Director, Russian Research Center "Kurchatov Institute"

12:55 – 14:00 Lunch

14:00 – 15:15 **Nanofunctional Surfaces (incl. Life Sciences)**

– **Self-organization and function of molecules on solid surfaces: routes towards molecular electronics**
Prof. Dr. Berndt Koslowski
Department of Solid State Physics, Ulm University

– **Single spins in diamond: quantum computing and atomic magnetometry**
Dr. Fedor Jelezko
3rd Institute of Physics, University of Stuttgart

– **Medical implants on the basis of nanostructured titanium with bioactive coatings**
Prof. Yuriy Kolobov
Director of the Center of Nanostructured Materials and Nanotechnologies, Belgorod State University

15:15 – 16:15 Coffee break

Poster Presentations by young researchers from Baden-Württemberg and Russia

Research Funding Programmes of German and Russian Science Organisations (information tables)

16:15 – 17:15 **Cooperation projects between Baden-Württemberg and Russia**

– **Experience in long-term collaboration between the Moscow State University and the Ulm University**
Prof. Dr. Alexei Khokhlov
Vice-Rector and Head of Chair of Polymer Physics and Crystallophysics, Lomonosov Moscow State University;
Head of the Department for Polymer Science, Ulm University

– **Nanoparticles in the hydrological cycle**
Prof. Dr. Fritz Frimmel
Head of Chair of Water Chemistry, Universität Karlsruhe (TH)

– **Novel structuring processes for micro- and nanotechnology**
Prof. Dr. Ulrich Mescheder
Executive Vice President Research, Director of Institute of Applied Research, Hochschule Furtwangen University

17.15 – 17.30 **Conclusion/Closing remarks**

CURRICULA VITAE

Prof. Dr. Fritz Hartmann Frimmel

Head of Chair of Water Chemistry

Chair of Water Chemistry
Engler-Bunte-Institut
Universität Karlsruhe (TH)
Engler-Bunte-Ring 1
D-76128 Karlsruhe
Phone: (0049) 721/608-2580
Fax: (0049) 721/6991 54
e-mail: fritz.frimmel@ciw.uni-karlsruhe.de

Academic history:

Professional Experience

Study: Chemistry, TU München

Dipl.-Chem. 1967

Dr. rer. nat. 1970

Postdoctoral Fellow: University College Dublin 1970/71 (Prof. Dr. D. A. Brown)

Ass. Lecturer: Institut für Wasserchemie und
Chemische Balneologie TU München, 1971–1987
Univ. Lecturer (Prof. Dr. K.-E. Quentin)

Inaugural dissertation: TU München 1981

Scholarship: Department of Environmental Sciences and Engineering,
University of North Carolina at Chapel Hill (Prof. Dr. R. F. Christman), 1983

Chair: Wasserchemie, Universität Karlsruhe, since 1987

Research Institute: DVGW-Forschungsstelle am Engler-Bunte-Institut der
Universität Karlsruhe, since 1987

Visiting Scientist: 1993, 1999 University of North Carolina at Chapel Hill, USA

1996 Akademie Nishnij Novgorod, Russian Federation

Vice President: October 1998 – October 2000, Universität Karlsruhe

Chairmanships:

- chairman of the Committee of "Micro and Trace Analysis of Elements" of the German Chemical Society (1986–1989) – head of the Water Chemistry Division of the German Chemical Society (GDCh) (1992–2003)
- President of the International Humic Substances Society 2000–2001
- Past President of the International Humic Substances Society (IHSS)
- Chairman of the International Academy for Sustainable Development and Technologies at the Universität Karlsruhe (until 2007)
- Head of the German-Russian Colleague at the Universität Karlsruhe (until 2007)
- Head of the German-Russian Post Graduate College at the Universität Karlsruhe (until 2007)
- Vice President of the Karlsruher Universitätsgesellschaft (since 2004)

Fields of research:

Biogeochemical Transformations of natural and synthetic water constituents

Methods for water treatment

Humic Substances

Prizes and awards:

Prize for young talents in the field of water chemistry;
Water Chemical Society in the German Chemical Society, 1975

Paulaner Research Award, 1984

Environmental Education Award SETAC-Europe / ABC Laboratories, 1992

Honory President of the Water Chemical Society, 2004

Willy Hager Medal, DECHEMA, 2004

Level II Scientific and Technological Achievement Awards (STAA),
Environmental Protection Agency (EPA), USA, 2008

Selected publications:

Tercero Espinoza, L. A., ter Haseborg, E., Weber, M., Frimmel, F. H.: Investigation of the Photocatalytic Degradation of Brown Water Natural Organic Matter by Size Exclusion Chromatography. Applied Catalysis B: Environmental 87, 56–62 (2009).

Iden, S., Delay, M., Frimmel, F. H., Durner, W.: Assessing contaminant mobilisation from waste materials: application of bayesian parameter estimation to batch extraction tests at varying liquid-to-solid ratios. Environ. Sci.Technol. 42, 3717–3723 (2008).

Lankes, U., Lüdemann, H.-D., Frimmel, F. H.: Search for basic relationships between "molecular size" and "chemical structure" of aquatic natural organic matter – answers from 13C and 15N CPMAS NMR spectroscopy. Wat. Res. 42, 1051–1060 (2008).

Schultz, N., Metreveli, G., Franzreb, M., Frimmel, F. H., Syldatk, C.: Zeta potential measurement as a diagnostic tool in enzyme immobilisation. Colloids and Surfaces B: Biointerfaces 66, 39–44 (2008).

Tercero Espinoza, L. A., Frimmel, F. H.: Formation of brominated products in irradiated titanium dioxide suspensions containing bromide and dissolved organic carbon. Water Research 42, 1778–1784 (2008).

Frimmel, F. H., Delay, M., Mangold, S.: Determination of chromium oxidation states in solid waste materials and eluates by XAS. ANKA Anual Report, 191–193 (2007).

Saravia, F., Zwiener, C., Frimmel. F. H.: Application of submerged membranes for the treatment of spent filter backwash water. Wat. Sci. Tech.: Vol.7, No 5–6, 157–165 (2007).

Zwiener, C., Richardson, S. D., De Marini, D. M., Grummt, T., Glauner, T., Frimmel, F. H.: Drowning in disinfection byproducts? Assessing swimming pool water. Environ. Sci. Technol. 41, 363–372 (2007).

Saravia, F., Naab, P., Frimmel, F. H.: Influence of particle size and particle size distribution on membrane-adsorption hybrid systems. Desalination 200, 446–448 (2006).

Doll, T. E., Frimmel, F. H.: Cross-flow microfiltration with periodical back-washing for photocatalytic degradation of pharmaceutical and diagnostic residues-evaluation of the long-term stability of the photocatalytic activity of TiO2. Wat. Res. 39, 847–854 (2005).

Müller, M. B., Fritz, W., Lankes, U., Frimmel, F. H.: Ultrafiltration of nonionic surfactants and dissolved organic matter. Environ. Sci. Technol. 38, 1124–1132 (2004).

Perminova, I. V., Frimmel, F. H., Kudryavtsev, A. V., Kulikova, N. A., Abbt-Braun, G., Hesse, S., Petrosyan, V. S.: Molecular weight characteristics of humic substances from different environments as determined by size exclusion chromatography and their statistical evaluation. Environ. Sci. Technol. 37(11), 2477–2485 (2003).

Dr. Fedor Jelezko

Senior Lecturer

3. Institute of Physics
University of Stuttgart
Pfaffenwaldring 57
D-70569 Stuttgart
Phone: (0049) 711/6856 52-76
Fax: (0049) 711/6856 52-81
e-mail: f.jelezko@physik.uni-stuttgart.de

Academic history:

Fedor Jelezko commenced his scientific career in the mid 1990s. During his PhD thesis (University of Bordeaux) he developed experimental techniques for the detection of single molecules in condensed matter using optical methods. After moving to the University of Stuttgart in 1999 he built the lab that enabled pioneering experiments on the application of single NV defects in diamond for quantum information processing. Since 2007, he has been permanently faculty member at Physics Department. In addition to his teaching and research activities, Fedor Jelezko also serves as referee for many academic journals, including Science, Nature Physics and Physical Review Letters.

In 2007 and 2008 he was appointed visiting Professor in Ecole Normale Superieure de Cachan (France).

Fields of research:

Single spin detection

Quantum optics

Prizes and awards:

In 2006 Fedor Jelezko was awarded a Quantum Communication Victoria Research Fellowship

In 2008 Fedor Jelezko was awarded the Walter-Schottky Prize of German Physical Society (DPG) for his work on quantum information processing with spins in diamond (this is the highest award of German Physical Society in solid state physics, see http://www.dpg-physik.de/dpg/preise/preistraeger2008.html.

Selected publications:

F Balasubramanian, G., Chan, I. Y., Kolesov, R., Al-Hmoud, M., Tisler, J., Shin, C., Kim, C., Wojcik, A., Hemmer, P. R., Krueger, A., Hanke, T., Leitenstorfer, A., Bratschitsch, R., Jelezko, F. & Wrachtrup, J. "Nanoscale imaging magnetometry with diamond spins under ambient conditions". Nature 455, 648 (2008).

G. Balasubramanian, Ph. Neumann, D. Twicthen, M. Markham, R. Kolesov, N. Mizuoschi, J. Isoya, J. Achard, J. Beck, J. Tissler, V. Jacques, P. R. Hemmer, F. Jelezko and J. Wrachtrup, Ultralong spin coherence time in isotopicallyengineered diamond, Nature Materials (accepted) DOI: 10.1038/NMAT2420 (2009)

Gaebel, T., Domhan, M., Popa, I., Wittmann, C., Neumann, P., Jelezko, F., Rabeau, J. R., Stavrias, N., Greentree, A. D., Prawer, S., Meijer, J., Twamley, J., Hemmer, P. R. & Wrachtrup, J. "Room-temperature coherent coupling of single spins in diamond". Nature Physics 2, 408–413 (2006).

Jelezko, F., Gaebel, T., Popa, I., Gruber, A. & Wrachtrup, J. "Observation of coherent oscillations in a single electron spin". Physical Review Letters 92, 076401 (2004).

Batalov, A., Zierl, C., Gaebel, T., Neumann, P., Chan, I. Y., Balasubramanian, G., Hemmer, P. R., Jelezko, F. & Wrachtrup, J. "Temporal coherence of photons emitted by single nitrogen-vacancy defect centers in diamond using optical Rabi-oscillations". Physical Review Letters 1, 077401 (2008).

Childress, L., Dutt, M. V. G., Taylor, J. M., Zibrov, A. S., Jelezko, F., Wrachtrup, J., Hemmer, P. R. & Lukin, M. D. "Coherent dynamics of coupled electron and nuclear spin qubits in diamond". Science 314, 281–285 (2006).

Santori, C., Tamarat, P., Neumann, P., Wrachtrup, J., Fattal, D., Beausoleil, R. G., Rabeau, J., Olivero, P., Greentree, A. D., Prawer, S., Jelezko, F. & Hemmer, P. "Coherent population trapping of single spins in diamond under optical excitation". Physical Review Letters 97, 247401 (2006).

Tamarat, P., Gaebel, T., Rabeau, J. R., Khan, M., Greentree, A. D., Wilson, H., Hollenberg, L. C. L., Prawer, S., Hemmer, P., Jelezko, F. & Wrachtrup, J. "Stark shift control of single optical centers in diamond". Physical Review Letters 97, 083002 (2006).

Dutt, M. V. G., Childress, L., Jiang, L., Togan, E., Maze, J., Jelezko, F., Zibrov, A. S., Hemmer, P. R. & Lukin, M. D. "Quantum register based on individual electronic and nuclear spin qubits in diamond". Science 316, 1312–1316 (2007).

Neumann, P., Mizuochi, N., Rempp, F., Hemmer, P., Watanabe, H., Yamasaki, S., Jacques, V., Gaebel, T., Jelezko, F. & Wrachtrup, J. "Multipartite entanglement among single spins in diamond". Science 320, 1326–1329 (2008).Cited 9 times

Prof. Dr. Alexei R. Khokhlov

Head of the Department for Polymer Science, Ulm University

Vice-Rector and Head of Chair of Polymer Physics and Crystallophysics, Lomonosov Moscow State University

Institute of Polymer Science
Ulm University
Albert-Einstein-Allee 47
D-89069 Ulm
Phone: (0049) 731/5031-390;
Fax: (0049) 731/5031-399;
e-mail: alexei.khokhlov@uni-ulm.de

Chair of Physics of Polymers and Crystals
Physics Department
Moscow State University
RUS-Moscow 119991
(007) 495/939-5340, (007) 495/939-1013
(007) 495/939-2988
khokhlov@polly.phys.msu.ru

Academic history:

PhD, Moscow State University, 1979

Doctor of Science, Moscow State University, 1983

Assistant Professor, Moscow State University, 1979–1984

Associate Professor, Moscow State University, 1984–1988

Full Professor, Moscow State University, since 1988

Head of the Chair of Polymer Physics and Crystallophysics, Moscow State University, since 1993

Vice-Rector of Moscow State University, 2008

OTHER APPOINTMENTS:

President of European Polymer Federation (2004–2005)

Member of Presidium of Russian Academy of Sciences, 2008

Chairman of the Polymer Council of Russian Academy of Sciences (from 2002, Vice-Chairman 1992–2002)

Institute of Organo-Element Compounds of Russian Academy of Sciences, Head of Laboratory of Physical Chemistry of Polymers (since 1991)

Director of the Center for Advanced Experimental Facilities of Russian Foundation for Fundamental Research (since 1995)

Foreign Special Visiting Professor, Nagoya University (Japan) (1992).

Adjunct Professor, State University of New York at Stony Brook (USA) (since 1993)

External Professor, University of Copenhagen (Denmark) (1997–2002)

Honorary Professor, Ulm University (Germany) (since 2000)

Associate Member of IUPAC Macromolecular Division Committee (1995–1997), Titular Member (1997–2001), Associate Member (2001–2003)

Member of the Board of Macromolecular Physics Section of European Physical Society (since 1999)

Fields of research:

Polymer science, statistical physics of macromolecules, physical chemistry of polyelectrolytes and ionomers, microphase separation in polymer systems, polymer liquid crystals, polyelectrolyte responsive gels, topological restrictions in polymer

systems, dynamics of concentrated polymer solutions and melts, coil-globule transitions, associating polymers, computer simulation of polymer systems, biomimetic polymers, proton-conducting polymer membranes.

Prizes and awards:

USSR Prize in Physics for Young Scientists, 1982

Humboldt Research Award (Germany), 1992

Full Member of Russian Academy of Sciences since 2000
(Member-Correspondent 1990–2000)

Member of Academia Europaea since 2000

Wolfgang Paul Research Award by German Federal Ministry of Education and Research, 2002–2004

Lomonosov Prize for Pedagogical Achievements, 2005

Polymer Technology Netherlands Award, 2005

Russian Federation National Award for Science and Technology, 2007

Selected publications:

Around 500 scientific papers, 6 books and 25 article reviews.

I. I. Potemkin, A. R. Khokhlov, S. Prokhorova, S. S. Sheiko, M. Moller, K. L. Beers, K. Matyjaszewski. Spontaneous Curvature of Comblike Polymers at a Flat Interface. Macromolecules, 2004, vol. 37, p. 3918.

M. O. Gallyamov, B. Tartsch, A. R. Khokhlov, S. S. Sheiko, H. G. Boerner, K. Matyjaszewski, M. Moeller. Conformational Dynamics of Single Molecules Visualized in Real-Time by Scanning Force Microscopy: Macromolecular Mobility on a Substrate Surface in Different Vapours. J. Microscopy, 2004, vol. 215, p. 245.

A. R. Khokhlov. Functional Copolymer Macromolecules: Design, Characterization and Properties. In: Modification and Blending of Synthetic and Natural Macromolecules, Eds. F. Ciardelli and S. Penczek, Kluwer Academic Publishers, 2004, p. 283.

I. I. Potemkin, N. N. Oskolkov, A. R. Khokhlov, P. Reineker. Effect of Low-Molecular-Weight Salt on the Nematic Ordering in Solutions of Rodlike Polyelectrolytes. Phys. Rev. E, 2005, vol. 72, p. 021804.

A. R. Khokhlov, P. G. Khalatur. Solution Properties of Charged Hydrophobic/Hydrophilic Copolymers. Current Opinion in Colloid and Interface Science, 2005, vol. 10, p. 22.

P. G. Khalatur, A. R. Khokhlov. Computer-Aided Conformation-Dependent Design of Copolymer Sequences. Advances in Polymer Science, 2006, vol. 195, p. 1.

N. Severin, I. M. Okhapkin, A. R. Khokhlov, J. P. Rabe. Absorption of Polyelectrolyte Molecules to a Nanostructured Monolayer of Amphiphiles. Nano Letters, 2006, vol. 6, p. 1018.

G. V. Stepanov, S. S. Abramchuk, D. A. Grishin, L. V. Nikitin, E. Yu. Kramarenko, A. R. Khokhlov. Effect of a Homogeneous Magnetic Field on the Viscoelastic Behavior of Magnetic Elastomers. Polymer, 2007, vol. 48, Nr. 2, p. 488.

G. A. Komarova, S. G. Starodubtsev, V. I. Lozinsky, E. V. Kalinina, K. Landfester, A. R. Khokhlov, Intelligent Gels and Cryogels with Entrapped Emulsions Langmuir, 2008, vol. 24, p. 4467.

O. A. Gus'kova, P. G. Khalatur, P. Bäuerle, A. R. Khokhlov. Silk-inspired, Molecular Chimeras': Atomistic Simulation of Nanoarchitectures Based on Thiophene-Peptide Copolymers Chemical Physics Letters, 2008, vol. 461, p. 64.

Prof. Yuriy R. Kolobov

Professor at the department of material science and nanotechnologies at Belgorod State University (BelSU)
Head of the Centre of Nanostructured Materials and Nanotechnologies at BelSU

Belgorod State University
Center of Nanostructured Materials and Nanotechnologies
Pobedy 85
RUS- 308015 Belgorod
Phone: (007) 4722/585407
Fax: (007) 4722/585406
e-mail: kolobov@bsu.edu.ru

Academic history:

2005-present, Belgorod State University. Professor at the department of material science and nanotechnologies at Belgorod State University (BelSU), and Head of the Centre of Nanostructured Materials and Nanotechnologies at BelSU. The research area of the group headed by Prof. Kolobov comprises:

– physics and mechanics of high-temperature plastic deformation;

– failure of polycrystalline and nanostructured materials;

– diffusion and diffusion-controlled phenomena in solids.

1990–2005, Institute of Strength Physics and Materials Science, Russian Academy of Science, Tomsk, Russia Head of department of Physics and Technological Problems of Solids Surface.

1981–1990, Siberian Physics Technical Institute, Tomsk Russia Chief of Lab

1979–1981, Siberian Physics Technical Institute, Tomsk Russia Scientific secretary

1975–1979, Siberian Physics Technical Institute, Tomsk Russia Senior Researcher

1972–1975, Tomsk State University, Tomsk, Russia post-graduate student

Fields of research:

Physics and mechanics of high-temperature plastic deformation

Failure of polycrystalline and nanostructured materials

Diffusion and diffusion-controlled phenomena in solids

Selected publications:

Yu. R. Kolobov, R. Z. Valiev, G. P. Grabovetskaya et al. Grain Boundary Diffusion and Properties of Nanostructured Materials, Cambridge International Science Publishing, 2007–250 p.

Yu. R. Kolobov, G. P. Grabovetskaya. Mechanisms of Creep in Bulk Nanostructured Metallic Materials. – In Monograph: Severe Plastic Deformation: Toward Bulk Production of Nanostructured Materials: Nova Science Publishers, Inc, 2005, p. 275–293.

B. Bokstein, M. Ivanov, Yu. Kolobov et al. Grain Boundary Diffusion in Consolidated Nanomaterials. Stress Effect On Grain Boundary Diffusion // Journal of Metastabile and Nanocrystalline Materials. – 2004. – V. 19. – p. 69–107.

B. Baretzky, M. D. Baro, Yu. R. Kolobov, at al. Fundamentals of interface phenomena in advance bulk nanoscale materials // Rev. Adv. Mater. Sci. – 2005. – Vol. 9. – P. 45–108.

Yu. R. Kolobov, I. V. Ratochka. Grain boundary diffusion and plasticity/superplasticity of polycrystalline and nanostructured metals and alloys. // Materials Science and Engineering A. – 2005. - V. 410–411. – p. 468–471.

E. V. Naidenkin, E. V. Dudarev, Yu. R. Kolobov, G. P. Bakach, T. G. Langdon. The effect of equal-channel angular pressing on structure-phase changes and superplastic properties of Al-Mg-Li alloy // Materials Science Forum. – 2006. – Vols. 503–504. – P. 983–988.

V. G. Pushin, A. I. Lotkov, Yu. R. Kolobov, R. Z. Valiev, E. F. Dudarev, N. N. Kuranova, A. P. Dyupin, D. V. Gunderov, G. P. Bakach. On the nature of anomalously high plasticity of high-strength titanium nickelide alloys with shape-memory effects: I. initial structure and mechanical properties // The Physics of Metals and Metallography. – 2008. – V. 106. – N5. – P. 520–530.

G. P. Grabovetskaya, I. P. Mishin, I. V. Ratochka, S. G. Psakhie, Yu. R. Kolobov. Grain-boundary diffusion of nickel in submicrocrystalline molybdenum processed by severe plastic deformation // Technical Physics Letters. – 2008. – V. 34. – N2. – P. 136–138.

Yu. A. Khon, Yu. R. Kolobov, M. B. Ivanov, A. V. Butenko. Nonequilibrium state of grain boundaries and spontaneous grain-boundary slippage in bicrystals // Technical Physics. The Russian Journal of Applied Physics. – 2008. – V. 53. – N3. – P. 328–333.

Prof. Dr. Berndt Koslowski

Apl. Professor
Head of the group 'Scanning Tunneling Microscopy'

Department of Solid State Physics
Ulm University
Albert-Einstein-Allee 1
D-89069 Ulm
Phone: (0049) 731/502-2974
Fax: (0049) 731/502-2987
e-mail: Berndt.koslowski@uni-ulm.de

Academic history:

Diplom degree: June 1989, Ludwig-Maximilian University, Munich

PhD: Nov 1993, Prof. Dr. K. Dransfeld, University of Konstanz

Postdoctoral thesis: December 1993 – April 1995 as Killiam Fellow with Prof. Dr. M. Jericho, Dalhousie University, Halifax, Canada

Assistant: since May 1995, Ulm University

Habilitation qualification to teach at professorial level: November 2003, Ulm University

Professorship (apl.): Professor at the Department of Solid State Physics, Ulm University since March 2008

Fields of research:

Scanning probe methods and nano-structuring: fundamentals and applications

Nanotechnology: fundamentals and applications

Structure forming phenomena on the nm scale

Structural and electronic characteristics on the nanometer scale, nano-electronics and atomic electronics

Selected publications:

Experimental evidence for a nonparabolic interface shift on the nanoscale during the dissolution of Ni into bulk Au(111)', *G. L. Katona, Z. Erdelyi, D. L. Beke, Ch. Dietrich, F. Weigl, H.-G. Boyen, B. Koslowski, P. Ziemann,* Phys. Rev. B 71 (2005) 115432.

Ultrathin Epitaxial Al_2O_3 Films Grown on Nb(110)/Sapphire(0001) Investigated by Tunneling Spectroscopy and Microscopy', *C. Dietrich, B. Koslowski, and P. Ziemann, J.* Appl. Phys. 97, (2005) 083515.

Non-parabolic shift of the phase boundaries on nanoscale in binary systems with restricted solubility: theory and experiment', *G. L. Katona, Z. Erdeyi, C. Dietrich, F. Weigl, H.-G. Boyen, B. Koslowski, P. Ziemann, and D. L. Beke,* Defect and Diffusion Forum 237–240, 1216–1221 (2005).

From self-organized masks to nanotips: A concept for the preparation of densely packed arrays of diamond field emitters', *F. Weigl, S. Fricker, H.-G. Boyen, Ch. Dietrich, B. Koslowski, A. Plettl, O. Pursche, P. Ziemann, P. Walther, Ch. Hartmann, M. Ott, M. Möller,* Diamond & Rel. Mat. 15 (2006) 1689.

Preparation of Arrays of Metallic Nanoparticles exhibiting Coulomb Blockade at Room Temperature: An Approach Based on the Selforganization of Metal-Loaded Diblock-Copolymers', *C. Dietrich, B. Koslowski, F. Weigl, and P. Ziemann, Surf. I.* Analysis. 38(6), 1034 (2006).

Design of an extremely stable low-temperature ultra-high vacuum scanning tunneling microscope', *B. Koslowski, C. Dietrich, A. Tschetschetkin, P. Ziemann,* Rev. Sci. Instrum. 77, 063707 (2006).

Dynamic Charging at Room Temperature of Au Nano Particles Prepared by a Micellar Technique', *B. Koslowski, C. Dietrich, F. Weigl, P. Ziemann,* Phys. Rev. B 75, 085407 (2007).

Evaluation of Tunneling Spectroscopy Data: Approaching a Quantitative Determination of the Electronic Density of States', *B. Koslowski, C. Dietrich, A. Tschetschetkin, P. Ziemann,* Phys. Rev. B 75, 035421 (2007).

Direct observation of slow morphological transformations and wetting behavior of pulsed laser deposited sub-monolayer gold on (0 0 0 1) sapphire in atmosphere', *L. M. Kukreja, B. Koslowski, R. Steiner, A. Plettl, P. Ziemann,* Appl. Surf. Sci., Accepted.

Thermal Stability of Size-Selected Arrays of Gold Nanoparticles on (1120)Sapphire – A Thermal Desorption Spectroscopy Study', *F. Weigl, B. Koslowski, P. Ziemann,* Surface Science 602 (2008) 3714–3720.

Prof. Mikhail Kovalchuk

General Director of Russian Research Center "Kurchatov Institute"

Director of A. V. Shubnikov Institute of Crystallography Russian Academy of Sciences

Russian Research Center "Kurchatov Institute"
Kurchatov Square 1
RUS-123182 Moscow
Phone: (007) 499/196-9481
Fax: (007) 499/196-4418
e-mail: koval@kiae.ru

Academic history:

EDUCATION:

Leningrad State University, Physical Faculty, Department of X-ray and condensed matter

SCIENTIFIC DEGREES:

Doctor (PhD) of Physical and Mathematical Sciences

Full Professor on X-Ray scattering and condensed (soft condensed) matter

Member of Russian Academy of Sciences (Physics and Astronomy Department)

OTHER APPOINTMENTS:

Scientific Secretary of Council of Science, Technology and Education of the President of Russian Federation

Chairman of Public Chamber Commission on Education and Science

Head of the chair "Physics of nanosystems" of the Faculty of physics of Moscow State University

Editor-in-chief of "Crystallography report" Russian Academy of Sciences

Chairman of advisory board of Nanotechnologies in Russia (Rossiiskie Nanoteknologii) journal

Fields of research:

X-ray physics and optics

X-ray and synchrotron radiation (SR)

Nano-bio-organic materials and systems

X-ray and SR in material sciences and crystallography

Protein crystallography

Condensed and soft matter physics

X-ray and SR instrumentation

Multiple diffraction

Selected publications:

Author of about 200 scientific publications in the leading international scientific journals and patents:

N. N. Novikova, S. I. Zheludeva, O. V. Konovalov, M. V. Kovalchuk, N. D. Stepina, I. V. Myagkov, Yu. K. Godovsky, N. N. Makarova, E. Yu. Tereschenko, L. G. Yanusova "Total reflection X-ray fluorescence study of Langmuir monolayers on water surface" 2003, J. Appl. Cryst. 36, p. 727–731.

A. E. Blagov, M. V. Kovalchuk, V. G. Kohn, V. V. Lider, Yu. V. Pisarevskii "Possibilities of Controlling an X-ray Beam with a Crystal Subjected to Long-Wave Ultrasonic Vibrations" Journal of Experimental and Theoretical Physics, Vol. 101, No. 5, p. 770–778

N. N. Novikova, E. A. Yurieva, S. I. Zheludeva, M. V. Kovalchuk, N. D. Stepina, A. L. Tolstikhina, R. V. Gaynutdinov . . ." Investigations of lipid/protein membrane models by X-ray fluorescence method" J. Synchrotron Rad., 2005. v. 12, p. 511–516

V. Korchuganov, M. Blokhov, Yu. Krylov, V. Kvardakov, S. Zheludeva, M. Kovalchuk, L. Moseiko, N. Moseiko, V. Novikov, D. Odintsov "The status-2004 of the Kurchatov center of SR" Nuclear Instruments and Methods in Physics Research A, 2005, v. 543, p. 14–18.

V. B. Molodkin, M. V. Kovalchuk, A. P. Shpak, S. I. Olikhovskii, Ye. M. Kyslovskyy, A. I. Nizkova, E. G. Len, T. P. Vladimirova, E. S. Skakunova, G. E. Ice, R. A. Barabash. "Bragg and diffuse multiple scattering effects and new principles of the diffractometry of 21st century". Review book "Diffuse Scattering in the 21st Century: Emerging Insights into Materials Structure and Behavior". (2007)

Parakhonskiy B. V., Bukreeva T. V., Parakhonskiy G. V., Skirtach A. G., Sukhorukov G. B., Khlebtsov N. G., Feigin L. A., Kovalchuk M. V. Permeability Adjustment of Polyelectrolyte Micro- and Nano Capsules by Laser Irradiation // Saratov Fall Meeting 2006: Nanostructures and nanoparticles: fabrication, properties, and applications. / Proc. SPIE. 2007. V. 6536. P. 653605.

Structural and transport properties of GaAs/δ-Mn/GaAs/InxGa1-xAs/GaAs quantum wells. *B. A. Aronzon, M. V. Kovalchuk, E. M. Pashaev, M. A. Chuev, V. V. Kvardakov, I. A. Subbotin, V. V. Rylkov, M. A. Pankov, I. A. Likhachev, B. N. Zvonkov, Yu. A. Danilov, O. V. Vihrov, A. V. Lashkul, R. Laiho.* / Journal of Physics: Condensed Matter. 20 (2008), p. 1–9.

Prof. Dr. Paul Leiderer

Head of Chair of Surface and Low-Temperature Physics

Physics Department
University of Konstanz
Universitätsstr. 10
D-78457 Konstanz
Phone: (0049) 7531/883-793
Fax: (0049) 7531/883-091
e-mail: paul.leiderer@uni-konstanz.de

Academic history:

1963–1969, Studying Physics at the Technical University of Munich

1969–1973, Doctoral Thesis, Technical University of Munich, Physics Department Career

1973–1974, Postdoc at Cornell University, Ithaca, N.Y. USA

1974–1975, Research Scientist with the Company „Gesellschaft für Automation und Organisation" in Munich

1975–1981, Scientific Assistant, Technical University of Munich

1979, Habilitation in Experimental Physics

1981, Professor (C2) at the Technical University of Munich

1982–1988, Professor (C3) at the Johannes-Gutenberg-University, Mainz

1988-present, Professor (C4) at the Physics Department of the University of Konstanz

Fields of research:

Nanostructures

laser-surface interactions

colloids

quantum fluids and solids

Prizes and awards:

1973–1974, Research Grant of the German Science Foundation

1980, Physik-Preis of the German Physical Society

2001-present, Member of the Senate of the German Science Foundation

2003-present, Member Heidelberger Akademie der Wissenschaften

2004-present, Member of the Swiss National Science Foundation

2004-present, Member Deutsche Akademie der Naturforscher Leopoldina

Selected publications:

D. C. Guhr, D. Rettinger, J. Boneberg, A. Erbe, P. Leiderer, E. Scheer, Influence of laser light onto the electronic transport through atomic-sized contacts, Phys. Rev. Lett. 99, 086801 (2007)

R. Taubert, F. Hudert, A. Bartels, F. Merkt, A. Habenicht, P. Leiderer, T. Dekorsy, Coherent acoustic oscillations of nanoscale Au triangles and pyramids: influence of size and substrate, New Journal of Physics 9, 376 (2007)

P. Möhrke, T.A. Moore, M. Kläui, J. Boneberg, D. Backes, S. Krzyk, L.J. Heydermann, P. Leiderer, and U. Rüdiger, Single shot Kerr magnetometer for observing real-time domain wall motion in permalloy nanowires, J. Phys. D: Appl. Phys. 41, 164009 (2008)

P. Leiderer, S. Nazin, and V. Shikin, Dip-effect in the conductivity of 2D electrons on a helium film with a rough substrate, Journal of Low Temp. Phys. 34, 4–5 (2008)

T. Geldhauser, P. Leiderer, J. Boneberg, S. Walheim, and Th. Schimmel, Generation of Surface Energy Patterns by Single Pulse Laser Interference on Self-Assembled Monolayers, Langmuir 24 (22), 13155–13160 (2008)

Prof. Dr. Ulrich Mescheder

Executive Vice-president for Research

Director Institute for Applied Research,
Director Competence Center for Microfabrication and Systemintegration, Baden Württemberg (ZeMiS)

Hochschule Furtwangen University
Department Computer and Electrical Engineering
and Institute for Applied Research
Gerwigstr. 9
D-78120 Furtwangen
Phone: (0049) 7723/9202-232
Fax: (0049) 7723/9202-633
e-mail: mes@hs-furtwangen.de

Academic history:

Graduated with Dipl. Phys. at the University of Marburg, Germany, in 1982 after study at University Bielefeld and Marburg (focus on solid state physics). Dr. rer. nat. (Ph. D.) from University Marburg in 1985, work on "Optoelectrical Measurements of amorphous Silicon".

From1985–1991 with the Philips Research Laboratory, Hamburg, Department Material Science, Thin film technology. Visiting scientist at the Institute for Microstructuring Technology (IMT) in Berlin, working on technological developments for x-ray-lithography (mask technology and characterisation techniques).

Since 1991 professor at HFU, the former Fachhochschule Furtwangen (FHF), University of Applied Sciences.

From 1996 director of Institute for Applied Research of the FHF.

Since 1998 head of the Microelectronic-laboratory at the FHF.

Since 2006 Executive Vice-president of the HFU

Recent research activities on microssystem technology, especially miniaturized sensors and high precision actuation, porous Silicon, MOEMS.

MEMBERSHIPS:

German Physical society, Verband deutscher Hochschullehrer, IEEE

Fields of research:

Microtechnology/Micromachining

Microsystems (MEMS)

Nanotechnology

Selected publications:

Author and co-author of about 70 publications in international journals and conference proceedings, author of a textbook „Mikrosysteme, Konzepte und Anwendungen" (Microsystems, concepts and applicatons, published in the Teubner Verlag, Germany).

P. Fürjes, A. Kovács, Cs. Dücsö, M. Ádám, B. Müller and U. Mescheder: "Porous Silicon Based Humidity Sensor with Interdigital Electrodes and Internal Heaters", Sensors and Actuators B 95 188–193, 2003

U. M. Mescheder, W. Kronast and N. Naychuk, "Reliability investigations in micromechanical devices", Sensors and Actuators A: Physical, Volume 110, Issues 1–3, Pages 150–156 (2004)

Selected publications:

M. Freudenreich, U. M. Mescheder, G. Somogyi, "Simulation and realization of a novel micromechanical bi-stable switch", Sensors and Actuators A: Physical, Vol. 114/2–3 pp 451–459, 2004

M. Herding, G. Somogyi, U. Mescheder, P. Woias, "A new micromachined optical fiber switch for instrumentation purposes", Proceedings of SPIE, Vol. 5455, 2004, pp. 264–2733

U. Mescheder „Porous Silicon: Technology and Application", Series: NATO Science Series II: Mathematics, Physics and Chemistry, Vol. 181, *Yurish, Sergey Y.; Gomes, Maria Teresa S.R.* (Eds.)2004, ISBN: 1-4020-2929-2, S. 273–288

U. Mescheder, M. Freudenreich, S. Somogyi, C. Estan: Distortion optimized Focusing Mirror Device with Large Aperture: Journal: SENSORS AND ACTUATORS A: PHYSICAL Vol. 130–131, 2006, p. 20–27

R. Huster, A. Kovacs, U. Mescheder "3-D Micro Free-Form Manufacturing in Silicon Micro-Free-Form Production for Plastics Moulding Technology", Proceedings Micro System Technology 2005,ed. H.Reichl, pp 55, Munich, (2005)

U. Mescheder, M. Freudenreich, S.Somogyi, C. Estan „Distortion optimized Focusing Mirror Device with Large Aperture", accepted for publication in Sensors and Actuators A, Sept. 2005, electronically available online since 14 November 2005

U. Mescheder, Z. Torok, W. Kronast "Active focusing device based on MOEMS technology", Proceedings of SPIE Vol. 6186, 618601 (April 2006), pp. 1–12

T. Hellmuth, K. Khrennikov, W. Kronast, R. Huster, and U. Mescheder, Optimisation and characterisation of parabolic membrane mirrors, SPIE Proceeedings, Strasbourgh, 2008, Volume "MEMS, MOEMS, and Micromachining III" (published online Apr. 25, 2008)

A. Kovacs, A. Kovacs, M. Pogany, U. Mescheder: Mechanical investigation of perforated and porous membranes for micro- and nanofilter applications, Sensors and Actuators B: Chemical Volume 127, Issue 1, 20 October 2007, Pages 120–125

A. Kovacs, B. Müller, J. Kritwattanakhorn, U. Mescheder, A. Peter, Ch. Ament, J. Wöllenstein, M.-L. Bauersfeld, S. Rademacher: Sensor system for air quality measurement, in T. Gessner (Hrsg) "Smart Systems Integration 2007, 1st European Conference & Exhibition on integration issues of miniaturized systems – MEMS, MOEMS, ICs and electronic components – Paris: March 27-28, 2007, p. 519–522, ISBN 978-3-8007-3009-4

U. Mescheder et al.: MEMS-BASED AIR QUALITY SENSOR: Digest of technical Papers, Transducers '07, Lyon (France), IEEE-catalog number 07TH8933C, 2007, p. 1417–1420, ISBN 1-4244-0842-3

Kritwattanakhorn, A. Kovacs, U. Mescheder, B. Müller, M.-L. Bauersfeld, S. Rademacher, J. Wöllenstein: Optimization of Platinum Adhesion in Electrochemical Etching Process for Multi-Sensor Systems; Sensors & Actuators B, Volume 127, Issue 1, Oct. 2007, 126–131

Text book
Mikrosystemtechnik: Konzepte und Anwendungen, Teubner-Verlag (2000), 292 S., 2. Auflage published August 2004

Prof. Dr. Günter Schatz

Director, Nanozentrum Euregio Bodensee (NEB)
and Steinbeis Center for Technology Transfer
"Nanostructures and Solid State-Analysis"

Department of Physics
University of Konstanz
Universitätsstraße 10
D-78457 Konstanz
Phone: (0049) 7531/88-3540
Fax: (0049) 7531/88-3090
e-Mail: guenter.schatz@uni-konstanz.de

Academic history:

Study of physics from 1964 to 1968 at the Free University, Berlin. Diploma work from 1968 to 1969 at the Hahn-Meitner-Institute for Nuclear Research, Berlin.

Then Assistent Professor at the University of Erlangen-Nürnberg, Doctor Degree 1971, Habilitation 1976. In between from November 1973 to Juli 1975 Max-Kade-Fellow at the State University of New York at Stony Brook/Long Island. Since 1976 Professor at the University of Konstanz. Establishing a research group working on "Surfaces and interfaces of solids", participation at several research networks funded by the German Science Foundation and the Federal Ministery. Author of the physics text book "Nuclear Solid-State Physics" (Teubner Verlag).

Several research stays abroad, among them from April 1981 to September 1981 as a Minerva-Fellow at the Weizmann Institute, Rehovot, Israel. Since 1987 close collaboration with the Weizmann Institute on the topic of polymer research funded by the German-Israeli-Foundation. March 1997 to June 1997 on sabbatical leave and research stay at Oregon State University, Corvallis, USA.

Dean of the Faculty of Physics 1984/85, 1991/92 and 2001/03, Vice-President for Research from December 1993 to March 1996. Since 1997 representative for the cooperation between University of Konstanz and Tel Aviv University, and member of the board of the Kurt-Lion-Foundation. 2003 foundation of Steinbeis-Transfer Centre "Nanostructures and Solid-State Analysis" and since 2007 managing director of the Nano-Zentrum Euregio Bodensee (Centre of compe-tence for technology transfer in the Lake Konstanz area).

Fields of research:

Nuclear solid state physics

Magnetism

Nanostructures

Selected publications:

Manfred Albrecht und Günter Schatz: Magnetic nano-structures: The next generation of magnetic data storage?, NanoS 1 (2005) 19

Manfred Albrecht, Guohan Hu, Ildico Guhr, Till C. Ulbrich, Johan-nes Boneberg, Paul Leiderer and Günter Schatz, Magnetic multila-yers on nanospheres, Nature Materials 4, 203 (2005)

M. Maret, B. Gilles, I. Guhr, B. Riedlinger, M. Albrecht, G. Schatz and E. Beaurepaire, Self-assembling of FePt nanostructures by quasi van der Waals epitaxy, J. Nanotechnology 15, 1590 (2004)

H. Wider, V. Gimple, W. Evenson, G. Schatz, J. Jaworski and M. Marszalek, Cobalt growth on Cu(111) in the presence of indium surfactant, J. Appl. Phys. 95, 5837 (2004)

H. Wider, V. Gimple, W. Evenson, G. Schatz, J. Jaworski, J. Prokop and M. Marszalek, Surface alloying of indium on Cu(111), J. Phys.: Cond. Matter 15, 1909 (2002)

M. Albrecht, M. Maret, A. Maier, F. Treubel, B. Riedlinger, U. Mazur, G. Schatz and S. Anders, Perpendicular magnetic anisotropy in CoPt3(111) films grown on a low energy surface at room tempe-rature, J. Appl. Phys. 91, 8153 (2002)

A. Maier, B. Riedlinger, F. Treubel, M. Maret, M. Albrecht, E. Beaurepaire, J. M. Tonnerre and G. Schatz, Nanostructured CoPt3(111) films grown on WSe2(0001), J. Magn. Magn. Mater. 240, 377 (2002)

E. Morenzoni, E.M. Forgan, H. Glückler, T.J. Jackson, H. Luetkens, Ch. Niedermayer, T. Prokscha, T.M. Riseman, M. Birke, A. Hofer, J. Litterst, M. Pleines and G. Schatz, Muon spin rotation and relaxation experiments on thin films, Hyperfine Interactions 133, 179 (2001)

M. Albrecht, A. Maier, F. Treubel, M. Maret, R. Poinsot and G. Schatz, Self-assembled magnetic nanostructures of CoPt3 with favoured chemical order, Europhys. Lett. 56, 884 (2001)

M. Dippel, A. Maier, V. Gimple, H. Wider, W. E. Evenson, R. L. Rasera and G. Schatz, Size-dependent melting of self-assembled indium nanostructures, Phys. Rev. Lett. 87, 095505 (2001)

Prof. Dr. Thomas Schimmel

University Professor, Joint Institute Director,
Institute of Applied Physics, Universität Karlsruhe (TH)

Head of an additional research group
at the Institute of Nanotechnology,
Forschungszentrum Karlsruhe

Institute of Applied Physics
Universität Karlsruhe (TH)
Wolfgang-Gaede-Straße 1
D-76131 Karlsruhe
Phone: (0049) 721/608-3570
Fax: (0049) 721/608-8480
e-mail: thomas.schimmel@kit.edu

Academic history:

Diplom degree in Physics: March 1985, Bayreuth University

PhD in Physics: July 1989, Prof. M. Schwoerer, Bayreuth University

Postdoctoral research: October 1989 – December 1990 as BASF Research Fellow with Prof. Dr. H. Fuchs, BASF Ludwigshafen

Junior research group: Jan. 1991 – Feb.1996, Bayreuth University

Habilitation qualification: July 1995

Professorship: Professor at the Institute of Applied Physics, Universität Karlsruhe (TH) since March 1996

Offer of Professorships at the Ludwig-Maximilians-Univeristät München (LMU) and at the Johannes-Kepler-Universität Linz

Co-founder and head of research group at the Institute of Nanotechnology, Forschungszentrum Karlsruhe since June 1998

Director at the Center of Applied Nanotechnology (CAN) of the Universität Karlsruhe (TH) since April 2000

Spokesman of the Network of Excellence on Functional Nanostructures

Fields of research:

Scanning probe methods and nanostructuring

Nanotechnology – fundamentals and applications

Structure formation and self-organization on the nm scale

Nanomaterials research and nano-structured surfaces

Nanoscale electrochemistry, electrochemical nanostructuring

Structural and electronic properties on the nanometer scale, nano-electronics and atomic-scale electronics; single-atom transistors

Friction at the atomic scale and nano-tribochemistry

Prizes and awards:

1987: Emil Warburg Prize

1993: Advanced Materials Prize

1994: Philip Morris Research Prize

2001: Baden-Württemberg Research Prize

Selected publications:

F.-Q. Xie, R. Maul, A. Augenstein, Ch. Obermair, E. B. Starikov, G. Schön, Th. Schimmel, and W. Wenzel: Independently Switchable Atomic Quantum Transistors by Reversible Contact Reconstruction, Nano Letters 8(12), 4493–4497 (2008)

F. Xie, R. Maul, Ch. Obermair, E.B. Starikov, W. Wenzel, G. Schön, Th. Schimmel: Pre-selectable integer quantum conductance of electrochemically fabricated silver point contacts, Applied Physics Letters, 93(4), 043103 (2008).

S. Kalinina, H. Gliemann; M. Lopez, A. Petershans, J. Auernheimer, M. Bruns, Th. Schimmel, H. Kessler, A. Schambony, D. Wedlich: Isothiocyanate-functionalized RGD-peptides for tailoring cell-adhesive surface patterns, Biomaterials 29, 3004–3013 (2008).

S. Anteboth, A. Brückner-Foit, M.J. Hoffmann, U. Sutter, Th. Schimmel, M. Müller: Electromechanical behaviour of PZT with real domain structure, Computational Materials Science 41, 420–429 (2008).

A. Pfrang, M. Müller, Th. Schimmel: Chemical Contrast Imaging, Photonik, 02/08 (2008).

F. Hennrich, R. Krupke, K. Arnold, J. A. R. Stütz, S. Lebedkin, Th. Koch, Th. Schimmel, M. Kappes: The mechanism of cavitation-induced scission of single-walled carbon nanotubes, Journal of Physical Chemistry B, 111 (2007).

H. Gliemann, A. T. Almeida, D. F. S. Petri, Th. Schimmel: Nanostructure formation in polymer thin films influenced by humidity, Surf. Interface Anal. 39, 1–8 (2007).

B. J. Mullins, A. Pfrang, R. D. Braddock, Th. Schimmel, G. Kaspers: Detachment of liquid droplets from fibres – experimental and theoretical evaluation of detachment force due to interfacial tension effects, Journal of Colloid and Interface Science 312, 333–340 (2007).

F.-Q. Xie, Ch. Obermair and Th. Schimmel: Configuring a bistable atomic switch by repeated electrochemical cycling, Invited article in: R. Gross et al. (eds.), Nanoscale Devices – Fundamentals and Applications. Springer, 153–162, 2006.

S. M. Pancera, H. Gliemann, Th. Schimmel, D. F. S. Petri: Effect of pH on the adsorption and activity of creatine phosphokinase, J. Phys. Chem. B 110, 2674–2680 (2006).

F.-Q. Xie, L. Nittler, Ch. Obermair, and Th. Schimmel: Gate-Controlled Atomic Quantum Switch, Phys. Rev. Lett. 93, 128303 (2004).

ABSTRACTS

Nanoparticles in the hydrological cycle

Prof. Dr. Fritz H. Frimmel, Universität Karlsruhe (TH)

Due to their special physical-chemical properties, Engineered Nano Particles (ENP) have found broad application in industry and daily life. This development is reflected in the expression "nano age". A consequence of the production and manifold use of nano materials is their uncontrolled emission into the environment. In contrast to the advantages of ENP production and application which are obvious and well understood, the environmental issue is in its infancy. There are some data for nano materials in the atmosphere, e. g. maximum allowed working place concentrations, but there are nearly none for aquatic systems.

The aim of the presentation is to set the scene for the fate of ENP in the water cycle and to address aspects of ENP with respect to a sustainable water management.

Analytical tools for the characterisation of ENP in water

Isolated ENP can preferably be visualised e. g. by Electron Microscopy or Atomic Force Microscopy. For characterization of suspended ENP in different water phases, Zeta Potentiometry of fractionation coupled with powerful elemental spectrometry are well suited.

Interactions of ENP with other water constituents

The surfaces of most ENP are either negatively charged or neutral. This gives rise to a lively interaction with dissolved cations and hydrophobic molecules. All these interactions are highly pH dependent. As a consequence, the transport behaviour of ENP is strongly influenced by the matrix of the water concerned and they can act as vehicles for a variety of water constituents.

Uptake of ENP by aquatic microorganisms

A vital question for the ecological function of aquatic systems is the interaction of ENP with biota. Here microorganisms are at the forefront. Mechanisms of possible uptake are still unclear. However, there is good evidence that (photo)reactive ENP like TiO_2 or Ag have toxic effects on aquatic bacteria.

Possibilities of removing ENP in water treatment

Striking properties of ENP are the large surface to volume relation and the surface charge. This does not only control processes like sorption, but also the interaction between particles which can lead to agglomeration. This process can be strongly influenced by the matrix effects of the water and it can be used effectively for a mechanical separation of the solid / liquid phases. This is a promising door opener for technical solutions fighting ENP as environmental pollutants.

References:

Wilkinson, K. J., Lead, J. R. (Eds.) (2007): Environmental Colloids and Particles: Behaviour, Separation and Characterisation. John Wiley & Sons.

Nowack, B. und Bucheli, T. D. (2007): Occurrence, Behaviour and Effects of Nanoparticles in the Environment. Environ. Pollut. 150, 5–22.

Use of methods "Selective change of atomic composition" of thin-film materials for creation functional nanostructures for various applications

Dr. Boris Gurovich, Russian Research Center "Kurchatov Institute"

Methods "Selective change of atomic composition" allow changing the chemical composition and physical properties of thin films or thin surface layers of bulk materials due to the influence of ion beams irradiation. The methods could be used to create directly the needed spatial modulations of atomic composition and physical properties of a material, such as metal or semiconductor patterns in insulators, magnetic drawings in nonmagnetic substances, light guides in opaque media, etc. It's important to note that selective change of atomic composition allows one to simultaneously change the physical properties of separate layers in a multi-layer structure. This is a principal advantage of the proposed technology compared to any other known technology or physical principle. As a result it enables the simultaneous (in parallel) production of structures with different shapes and properties in various layers by ion irradiation through the same mask. Such a procedure allows one to get an overlapping of the structure elements in various layers with an accuracy of about 1 nm. The latter feature is a crucial point in the production of multi-layer nanostructures. The methods can be easily combined with traditional CMOS technology to produce hybrid devices (the nanostructures being prepared by the proposed methods).

We have already successfully tested these methods for some elements production of the future nanodevices, the following results being obtained:

- the resolution of 15 nm was achieved
- the possibility of given relief production on the solid surface with 15 nm resolution has been demonstrated and the prototype of 3.5 inch stamp for imprint lithography was prepared with 1.5 micron resolution
- the possibility of parallel and simultaneous modification of material' properties in various layers of thin-film multilayer structure was experimentally shown
- it has been demonstrated that nanopatterns of areas with needed physical properties can be produced in various layers of thin-film multilayer structure through a single mask
- the possibility of patterned magnetic and conducting medias production was demonstrated with areal density of elements up to 153 Gb/inch

Single spins in diamond: quantum computing and atomic magnetometry

Dr. Fedor Jelezko, Prof. Dr. Jörg Wrachtrup; University of Stuttgart

Diamond is not only the king gemstone, but also a promising material in modern technology (which holds a promise to replace silicon) owing to unprecedented thermal conductivity, high charge carrier mobility and chemical inertness. Less known is that defects in diamond can be used for a variety of intriguing application ranging from quantum information processing to bio analytics. Owing to their remarkable stability, colour centers in diamond have already found an application in e.g. quantum cryptography. When doped into nanocrystals the defects offer some outstanding advantages to optical cellular microscopy. In this talk I will discuss recent progress regarding the application of these novel types of nanostructures to information- as well as biotechnoloy.

References:

Balasubramanian, G. et al. Ultralong spin coherence time in isotopically engineered diamond. Nature Materials DOI: 10.1038/NMAT2420 (2009)

Balasubramanian, G. et al. Nanoscale imaging magnetometry with diamond spins under ambient conditions. Nature 455, 648–651 (2008).

Neumann, P. et al. Multipartite entanglement among single spins in diamond. Science 320, 1326–1329 (2008).

Experience in long-term collaboration between the Moscow State University and the Ulm University

Prof. Dr. Alexei Khokhlov; Ulm University and Lomonosov Moscow State University

The collaboration in polymer science between Moscow State University and the Ulm University started in 1991. Since that time this collaboration passed a variety of stages and developed in the long-term and large-scale project. This project is rather unique, and gathered experience in many forms of collaboration can be useful in general for Russian-German interuniversity collaboration.

Medical implants on the basis of nanostructured titanium with bioactive coatings

Prof. Yuriy Kolobov, Belgorod State University

The criteria of biochemical and biomechanical compatibility of metals and alloys with tissues of living body and also the requirements of good technological plasticity at manufacturing from them medical implants. New high-productive and low-cost methods of nanostructured state formation in titanium and its alloys are discussed. (Yu.R. Kolobov et. al. Grain Boundary Diffusion and Properties of Nanostructured Materials, Cambridge International Science Publishing, 2007, 250 p.)

Practical methods of bioinert and bioactive hydroxyapatite coatings formation on titanium alloys using microplasmous deposition method in electrolytes with hydroxyapatite powder adding are analyzed. Features of growth of a bone fabric in the presence of bioactive coatings are considered. Data of biological researches "in vivo" and "in vitro" are cited. The information on the developed industrial ways of reception of hydroxyapaptite powders and their application in medical practice is given.

Self-organization and function of molecules on solid surfaces: routes towards molecular electronics

Prof. Dr. Berndt Koslowski, Prof. Dr. Paul Ziemann; Ulm University

The purpose of our talk is twofold: we first give a short overview over activities in the field of molecular electronics within the collaborative research unit SFB569 installed at our university. In the second part, we report on our results obtained with a low-temperature ultra-high vacuum Scanning Tunneling Microscope. This method is capable of revealing the geometric and electronic structure of molecules adsorbed on a metal surface on a submolecular level. Furthermore, the dynamic properties, i.e., the vibronic behavior can be determined. In the presented case we investigate mercaptopyridine and di-thio-di-pyridine adsorbed on a Au(111) surface which is a promising candidate for later electronic applications. We analyze the adsorption geometry of the molecules. To reveal the electronic structure of the molecules we employ different techniques of scanning tunneling spectroscopy. Finally, we present results of inelastic electron tunneling spectroscopy (IETS) and compare the experimental spectrum with theoretical data.

Nano-Opto-Mechanics: Laser-induced mechanical effects in nanostructures

Prof. Dr. Paul Leiderer, University of Konstanz

When nanostructures at surfaces (like particles or structured films) are irradiated with short laser pulses, a variety of mechanical phenomena are observed: at low intensities mechanical oscillations of the structures are excited, which due to the small dimensions typically lie in the GHz range. At higher light intensities the structures may be molten and as a consequence can change their shape and may even jump off the surface. At even higher intensities the structures are ablated by local evaporation and plasma formation, and the ablation pattern allows one to draw conclusions about the optical near fields of the structures. Applications of such nano-opto-mechanical effects are the patterning of surfaces and the contactless removal of small dust particles from surfaces, the so-called Laser Cleaning.

Novel structuring processes for micro– and nanotechnology

Prof. Dr. Ulrich Mescheder, MSc Alexey Ivanov, Dr. Andras Kovacs, Hochschule Furtwangen University

Prof. Dr. Victor Lubimov, State University Tula

In the presented work the process for 3D silicon master forms by electrochemical etching for injection molding of optical micro elements is studied.

Electrochemical etching of bulk silicon (anodization) is a flexible tool for etching of 3D structures in silicon. The etching is performed in a bath with fluorine-based electrolyte under applied current. Shape control of the structures is provided by local variation of current density flowing through the interface electrolyte-bulk silicon [1]. The needed local current density variation is achieved by masking particular areas of the wafer surface (one side or even both sides) with conductive or non-conductive masking materials. Thus, 3D forms are provided by creating corresponding current density profiles within the etched area, i.e. by a controlled variation of the anisotropy factor of the electrochemical etching over the mold area. In general, with non-conductive masks at low current densities a so called edge-effect takes place: the etching rate near the edges of the mask is higher than in the middle of an opening in the mask due too specific current flow in silicon wafer (current concentration effect) [1, 2]. Local electrical contacts on the wafer help to solve the problem of edge-effect and present additionally a powerful tool to change shape of the structures by changing of current flow [1]. Another significant factor for controlling the shape in this process is flow or diffusion of chemical species to the reaction site [3].

To use such Si-micromolds for molding optical elements, high surface quality (low roughness values) is essential. An important feature of the used anodization process is the possibility to integrate an electropolishing step into the 3D-formation process to achieve a high quality of anodized surfaces suitable for optical applications [4]. Electropolishing is used in our work either as a second and final step after formation of 3D structures, or as single step process of combined etching and electropolishing. In this paper we present the electropolishing process in the parameter-space of etchant concentration (concentration of hydrofluoric acid) and density of applied current, integrated in a 3D form shaping process.

The results of 3D-formation by the described anodization process are compared to 3D-formation using an ECM (Electro Chemical Machining) type process developed at the University of Tula. The quality of this approach is shown and compared to the anodization process using AFM measurements.

The possibility to combine these two approaches for improved flexibility in respect to arbitrary shapes is discussed.

Literature:

[1] *Huster R., Kovacs A., Mescheder U.:* 3-D Micro Free-Form Manufacturing in Silicon, Micro System Technologies 2005, München, October 5–6 (2005), 55–62.

[2] *Ivanov A., Mescheder U., Kovacs A., Huster R.* „Einfluss unterschiedlicher Passivierungsschichten auf die Bildungsrate von porösem Silizium an Strukturkanten bei der 3D-Formherstellung", Mikrosystemtechnik Kongress 2007, Dresden, Deutschland, Proceedings, 2007, s. 529–532.

[3] *A. Ivanov, U. Mescheder, M. Kröner, P. Woias:* Formation of arbitrarily shaped 3D-forms in silicon by electrochemical wet-etching, 19th MicroMechanics Europe Workshop, 28–30 September, 2008, Aachen, Deutschland, Tagungsband, ISBN 978-3-00-025529-8, S. 315–318

[4] *H. Föll, M. Christophersen, J. Carstensen, G. Hasse;* Formation and application of porous silicon (review), Material Science and Engineering R280, 2002, pp. 1–49.

Technology transfer – from nano-analytics to nano-magnetism

Prof. Dr. Günter Schatz; University of Konstanz

The University of Konstanz is active in fostering technology transfer into the regional industry. Therefore a competence centre for technology transfer (NEB) has been founded in 2007, which is also supported by the local chambers of commerce. Examples of this activity will be presented. With focused-ion beam milling thin films can be cut and investigations of film thickness and composition can be performed. Especially interesting are defect inclusions and their characterization in order to avoid product deterioration. Nanostructure arrays produced by laser interference are investigated and possible application areas will be discussed. Finally, developments for the increase of magnetic data storage capacities will be shown. These new developments are based on the concept of tilted magnetic media, where magnetic caps on colloid particles serve as storage units.

Nanoscience in Baden-Württemberg – from nanomaterials to nanodevices

Prof. Dr. Thomas Schimmel,
Universität Karlsruhe (TH) and Forschungszentrum Karlsruhe

Collaborative research in the field of nanotechnology in the state of Baden-Württemberg is organized within the Research Network of Excellence on Functional Nanostructures, including scientists from more than 70 research groups. This network, which is funded by the Landesstiftung Baden-Württemberg and the Ministry of Science, Research and the Arts Baden-Württemberg, acts as a platform for collaboration and scientific exchange. It represents an interdisciplinary network including both theoretical and experimental groups in the fields of physics, chemistry and life sciences, as well as materials science and electrical engineering. The network makes use of synergies between leading institutions in the field of nanotechnology in Baden-Württemberg, focusing on three key aspects:

A – Self-Organized and Biofunctional Nanostructures,

B – Electronic Properties of Nanostructures,

C – Optical and Magnetic Properties of Nanostructures.

Collaborative research on the world´s smallest transistor, the Single-Atom Transistor, is given as an example for successful interdisciplinary cooperation.

Nanostucturization of materials for atomic energetic

Prof. Yaroslav I. Shtrombakh, Russian Research Center "Kurchatov Institute"

Influence of nanostructural components of a number of reactor materials on their behavior and service properties under irradiation have been established.

Influence of the crystal grains with less than 100 nm sizes on radiation stability of reactor grade nuclear graphites are revealed.

For VVER reactor materials it is shown that occurrence of radiation-induced precipitates with the sizes ~ 1–2 nm appreciably determines the properties degradation and service life of reactor vessels and their composition influences transformation kinetics while in service.

In case of materials for cladding of fuel elements it has been established that injection of nanodispersed metal oxides with the sizes ~ 2-5 nm into materials allows to create, so-called, oxide dispersion strengthened steels (ODS-steels) which are characterized by slower rate of void swelling and better irradiation-enhanced creep at elevated temperature. Last circumstance is the key moment at creation of materials for cladding of fuel elements, intended for commercial reactors on the fast neutrons.

Poster Presentations by Young Scientists

- ***Micro-structured protein nanoarrays on solid and soft supports***

Daniel Aydin

Max Planck Institute for Metals Research Stuttgart, Dep. of New Materials and Biosystems and Heidelberg University, Dep. of Biophysical Chemistry
daydin@ix.urz.uni-heidelberg.de
www.mf.mpg.de
www.pci.uni-heidelberg.de/bpc/biophysik.html

- ***Molecular editing of polymer brushes with the tip of an AFM***
- ***Polymer phase separation on surface energy patterns generated by single pulse laser interference***

Dr. Matthias Barczewski

Forschungszentrum Karlsruhe, Institute of Nanotechnology
matthias.barczewski@int.fzk.de
www.schimmel-group.de

- ***Implementation of superconductor-ferromagnet-superconductor π-shifters in superconducting digital and quantum circuits***

Dr. Vitaly Bol'ginov

Institute of Solid State Physics Russian Academy of Sciences
bolg@issp.ac.ru
www.issp.ac.ru

- ***Ultrafast quantum optics with solid state nanosystems***
- ***Ultrafast spintronics with semiconductor nanostructures***

Dr. Rudolf Bratschitsch

University of Konstanz, Department of Physics
rudolf.bratschitsch@uni-konstanz.de
www.uni-konstanz.de/quantum-electronics
www.uni-konstanz.de/CAP

- ***Colloidal particles as model systems for microscopic***
- ***Molecular electronics***

Dr. Artur Erbe

University of Konstanz, Department of Physics
artur.erbe@uni-konstanz.de
www.uni-konstanz.de/FuF/Physik/Leiderer

- ***Probing individual Mn_{12} single molecule magnets with STM***
- ***Structure and electronic properties of graphene on metallic surfaces***

Dr. Mikhail Fonin

University of Konstanz, Department of Physics
mikhail.fonin@uni-konstanz.de
www.uni-konstanz.de/ruediger

- ***Low temperature CO oxidation over platinum catalyst***

Dr. Anastasia Grigorieva

M.V. Lomonosov Moscow State University
anastasia@inorg.chem.msu.ru
http://fmg.inorg.chem.msu.ru, www.fnm.msu.ru

- ***Interaction of nanscale spin structure and spin-polarised charge carriers in nanoconstrictions and pointcontacts***
- ***Scanning probe microscopy measurements and electromigration of metallic nanostructures under ultra-high vacuum conditions***

Dr. Regina Hoffmann-Vogel

Universität Karlsruhe (TH), Physikalisches Institut
r.hoffmann@physik.uni-karlsruhe.de
www.pi.uni-karlsruhe.de

- ***On possible creation of nanoscale electric fields by $C_{60}F_{18}$ polar molecules***

Alexey Lebedev

RRC Kurchatov Institute
aml@kcsr.kiae.ru
www.kcsr.kiae.ru

- ***Mimicking cellular enviroments: cells on elastic nanopatterned substrates***

Ilia Louban

Max Planck Institute for Metals Research Stuttgart, Dep. New Materials and Biosystems and
Heidelberg University, Dep. of Biophysical Chemistry
louban@uni-heidelberg.de
www.mf.mpg.de
www.pci.uni-heidelberg.de/bpc/biophysik.html

- ***The single-atom transistor***
- ***Electrochemical nanolithography with the tip of an AFM***

Dr. Christian Obermair

Universität Karlsruhe (TH), Institute for Applied Physics
christian.obermair@physik.uni-karlsruhe.de
www.schimmel-group.de

- ***A low temperature STM and STS study of ter-thiophen and mercaptopyridine adsorbed onto Au(111)***
- ***Nanoparticles on the basis of emulsion techniques***

Christian Pfahler

Ulm University, Department of Solid State Physics
christian.pfahler@uni-ulm.de
www.uni-ulm.de/fkp

- ***Crazing of polymers in the solutions of high-molecular-mass compounds as a news method for the preparation of polymer-polymer blends***

Dr. Ekaterina Rukhlya

M.V. Lomonosov Moscow State University, Chemistry Department
katrin310@yandex.ru
www.chem.msu.ru

- ***Scanning photocurrent microscopy of nanoelectronic devices based on carbon structures***

Adarsh Singh Sagar

Max Planck Institute for Solid State Research Stuttgart
a.sagar@fkf.mpg.de
www.fkf.mpg.de/kern

- ***Quinonoid ligands in coordination chemistry: from molecules to materials***

Dr. Biprajit Sarkar

University of Stuttgart, Institute for Inorganic Chemistry
sarkar@iac.uni-stuttgart.de
www.iac.uni-stuttgart.de

- ***X-ray diagnostic methods for analysis of nanosized semiconductor heterostructure with quantum wells and quantum dots***

Dr. Ilia Subbotin, Igor Likhachev

RRC Kurchatov Institute
grondo@mail.ru
likhachev82@mail.ru
www.kcsr.kiae.ru

- ***Production and properties of graphene films***

Anastasia Tyurnina

M.V. Lomonosov Moscow State University, Department of Physics
turnina@polly.phys.msu.ru
http://polly.phys.msu.ru/~turnina

- ***Nanostructure of Pt/Al_2O_3 catalysts for oxidation of CO and light hydrocarbons***

Alexey Veligzhanin

RRC Kurchatov Institute
alexey.veligzhanin@gmail.com
www.kiae.ru

- ***Micellization theory of diblock-copolymers with polyelectrolyte block in a selective solvent***

Sergey Venev

M.V. Lomonosov Moscow State University, Department of Physics
wenew@polly.phys.msu.ru
http://polly.phys.msu.ru

- ***Light emission from nanostructures based on silicon quantum dots***

Dr. Denis Zhigunov

M.V. Lomonosov Moscow State University, Faculty of Physics,
Department of General Physics and Molecular Electronics
zhigunov@ofme.phys.msu.ru
http://ofme.phys.msu.ru

ORGANISED BY

bw-i
Baden-Württemberg International

IN COOPERATION WITH

LANDESSTIFTUNG
Baden-Württemberg

Kompetenznetz
Funktionelle Nanostrukturen
Baden-Württemberg

Imprint:

bw-i
Baden-Württemberg International

Agency for International Economic and
Scientific Cooperation

Haus der Wirtschaft
Willi-Bleicher-Str. 19

70174 Stuttgart
Germany

Phone: +49(0)711.22787-0
Fax: +49(0)711.22787-22

E-Mail: info@bw-i.de
Internet: www.bw-i.de
www.bw-invest.de
www.bw-wfk.de

SPONSORED BY THE

Federal Ministry
of Education
and Research