NSI PROJECT General Information

Based on a suggestion of the Austrian Council for Research and Technology Development the Austrian Nano Initiative was founded to strengthen the national activities in the field of NanoScience and Technology. In 2004 FFG and FWF, the two funding agencies initially administering the program, issued the First Call for Program Line I: Project Clusters in this emerging interdisciplinary field. The Johannes Kepler University (JKU) and Upper Austrian Research (UAR), the research institution of the province of Upper Austria, brought together a consortium of three companies and four research institutions, which participated in the First Call with their proposal Nanostructured Surfaces and Interfaces (NSI). Following the suggestions of an international refereeing board, five out of a total of eight consortia proposals submitted to the First Call were awarded funding for a two-year period each. At a total budget of € 1.8 M, the project cluster NSI received for its six interlinked projects funding of € 1.5 M for the first two-year funding period. NSI is coordinated by F. Schäffler from the Institut for Semiconductor Physics at JKU; and co-chaired by O. Höglinger from UAR. Project work of the first funding period commenced in March 2005.

In 2006 the Third Call of the Austrian Nano Initiative was issued, the main purpose of which was the extension for another two-year period of the project clusters funded in the First Call. Again, full proposal were requested, which went through the same international refereeing procedure as before. The NSI-consortium members used this opportunity to refocus their activities, and to increase the number of projects from originally six to nine. Additional companies were recruited, to enhance the application aspects of NSI, and also a EUREKA project was incorporated to strengthen international collaboration. All nine projects of the second NSI proposal were approved with less than 10% funding cuts. NSI-2 started in March 2007 with a total budget of € 2.6 M, of which € 2 M are funded by the Austrian Nano Initiative.

In 2008 the Fifth Call of the Austrian Nano Initiative was issued, again focused on the extension of the project clusters from the odd-numbered Calls for, this time, a maximum period of three years. Simultaneously, the total maximum funding period of a cluster was limited to seven years, i.e., for clusters from the First Call, like NSI, the Fifth Call will provide the last funding period. In addition, the funding rules were substantially changed to those of the industry-oriented FWF funding agency. NSI participated in the Fifth Call again with dynamical adjustments to both the development of the NanoScience/Technology field as a whole, and the development within the cluster and its industrial environment. The total number of projects is now eight, half of which are led by industrial partners. In addition, the number of industrial partners was increased. With these measures, NSI-3 follows the general concept of the Austrian Nano Initiative, namely to develop research results gained in the initial phases of a cluster into mid-term industrial applications. NSI-3 started in March 2009 with a total budget (for three years) of € 3.6 M, of which € 3.1 M are funded by the Austrian Nano Initiative.

The general purpose of NSI is, to link the expertise and infrastructure in the field of NanoScience and Technology, which was systematically developed since the early 1990s in Linz and Upper Austria, and to make them available to both the Austrian industry and to education inside and outside the university. NSI is on its way to convert the originally rather loosely linked NanoScience and Technology activities in

Linz into a nationally and internationally competitive center of excellence. It is intended to develop NSI into a local node in the emerging Austrian NanoScience and Technology Network, located in Upper Austria, the leading industrial center of Austria. In terms of education, the research projects of NSI provide qualified research positions for the students of the first Austrian NanoScience and Technology course, which was launched in 2002 at the Johannes Kepler University in Linz. Meanwhile, a Master Course in this field has been worked out, which will start in fall 2009.

NSI covers three of the four main competence areas of the NanoScience and Technology activities in Linz and Upper Austria, and makes them available to the concept of the Austrian Nano Initiative. These three competence fields are Biocompatible Nanostructures, Polymers and Nanocomposites, and Metallic Clusters. Semiconductor Nanostructures, the fourth core competence in Linz, is already more advanced regarding its national and international integration and will mainly be pursued in the recently installed, Austrain-German Spezialforschungsbereich IR-ON funded by FWF, as well as in the PLATON project cluster form the Second Call of the Austrian Nano Initiative. Links between NSI, IR-ON and PLATON exist via participation of the Institute for Semiconductor and Solid State Physics in several of the NSI projects. This way the expertise and infrastructure available in and around the cleanroom of the institute is made available in an interdisciplinary approach to the other core competence areas.

NSI Projects

Third Funding Period (03/09 - 02/12) - Overview

The third funding period of the Research Project Cluster (RCP) ***Nanostructured Surfaces and Interfaces (NSI)*** brings together six companies and five research institutions with a total of 19 partners/major subcontractors. It is based on the expertise and infrastructure of the *NanoScience/Technology Center Linz (NSTL)*, a common project of the Technical/Natural Science Faculty (TNF) of the Johannes Kepler Universität (JKU) and the Upper Austrian Research GmbH (UAR).

NSI consists of eight research projects (RP) organized in the three Topical Fields: TF1: *Bio-Nanotechnology*, TF2: *Nanocomposites*, and TF3: *Surfaces and Interfaces*.

These three TFs represent main competence areas of NSTL and the RPC consortium. Additional contributions come from a fourth TF in Linz, Semiconductor

Nanostructures, which provides top-down and bottom up nanostructuring techniques as well as nanoanalytics.

In the following the RPs are briefly introduced and assigned to the respective TF. BI projects are basic research projects following the refereeing and funding rules of FWF, the Austrian Science Foundation, BII projects are industry-led applied research projects following the rules of FFG, the Austrian Funding Agency for Industrial Research.

1. Bio-Nanotechnology

1.1 Nanostructured und Biofunctionalized Surfaces (NABIOS)

This BI project employs nanostructured templates to localize individual biomolecules, which are then characterized either by fluorescence microscopy or atomic force microscopy (AFM). Potential applications of NABIOS are fast DNA sequencing and screening tests.

1.2 Nano-Biocompatible Polymerfoils (NBPF)

This BI project has successfully developed nano-patterning methods of polymer surfaces, which allow the control of cell growth and proliferation. The present objective of NBPF is the development of optimized nano-features on polymer supports for direct control of cell differentiation in tissue engineering applications.

1.3 Fast Active Bio-Cantilever (FABICAN)

This BII project aims toward the development of fast, active cantilevers for next-generation AFM instruments. This project is strongly linked to the AFM part of NABIOS.

2. Nanocomposites

2.1 Shape Controlled Nanocrystals for Magneto-Electronic Applications (NanoShape)

This BI project aims toward optimized properties of magnetic nanocrystals, modified molecular shells, the demonstration of magneto-electronic device operation with these nanocrystals, and magneto-transport at single nano-particles.

2.3 Functional Nanoscale Additives for Coating Powder Polymer Materials (NanoPow)

This BII project develops and optimizes nanoscale inorganic additives for the production of transparent and long-term UV-stable coating materials based on polyester resins.

2.2 Thermal Conducting Polymer Carbon Nanotube Composite Materials (PolyTube)

This BII project developed from the former project SolTube, and is now exclusively concentrated on the thermal conductivity of polymer materials that are filled with carbon nanotubes and -fibers. An additional industrial partner was recruited, who provides expertise in plastic molding and filling.

3. Nanoanalytics

3.1 Analytics on nanosized objects based on electron- or light interaction with matter (NanoProbe)

Bridging the aforementioned Topical Fields 1 and 2, BI RP NanoProbe (Analytics on nanosized objects based on electron- or light interaction with matter) was added for the third funding period to account for the need of the consortium for the development and utilization of nanoanalytical techniques. NanoProbe is based on electron microscopy and optical nanoanalytical techniques, which are of major importance to the consortium. The role of NanoProbe is on the one hand scientific research of its own right, aiming toward the further development of the two techniques, and, on the other hand, service functions for the demanding tasks of the consortium regarding nanaoanalytics for structural, compositional and magnetic characterization. Felmi in Graz contributes as a new strategic partner, providing complementary infrastructure and expertise in the field of transmission electron microscopy.

NSI Partners

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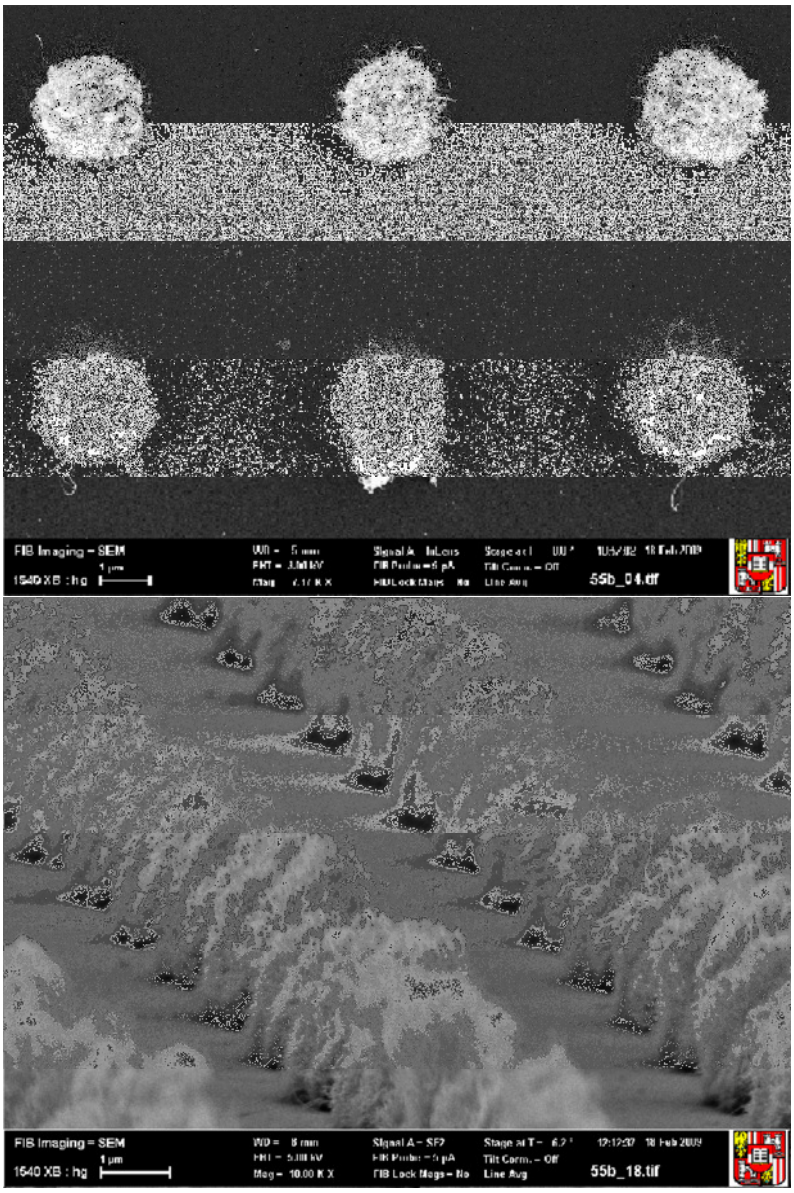
- **Transfercenter für Kunststofftechnik GmbH**
  represented by DI Volker Reisecker
  Franz-Fritsch-Straße 11
  A-4600 Wels

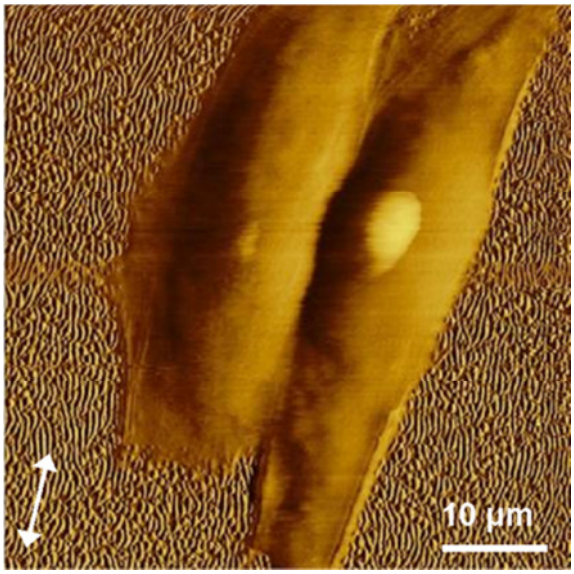
Gallery

Projekt SolTube/PolyTube

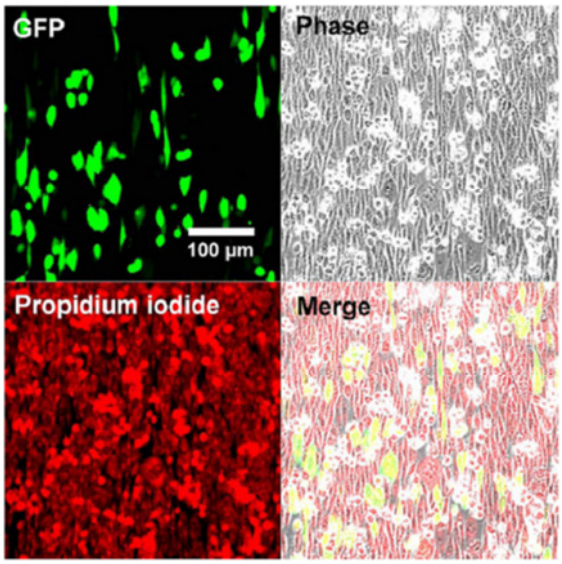


Selektiv abgeschiedene Kohlenstoff-Nanoröhrchen (CNT). Dazu wurde der Katalysator für das CNT-Wachstum in Form von Nanokristallen in einem Nanoimprint-Verfahren (NIL) strukturiert aufgebracht.

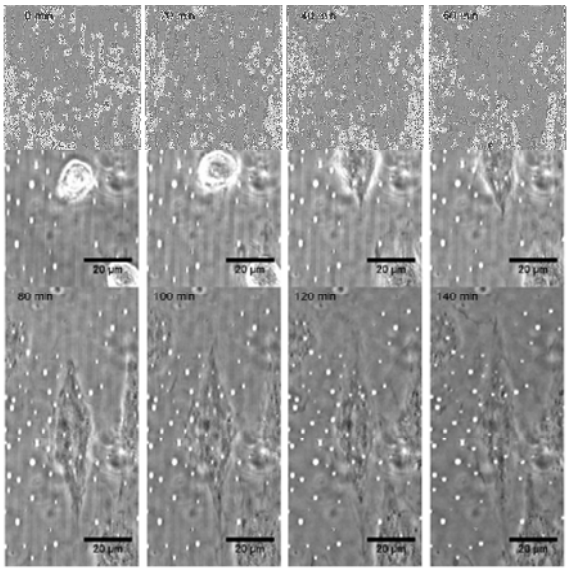
Projekt NBPF



CHO-Zellen auf nanostrukturiertem Polystyrol. Man erkennt deutlich die Vorzugsrichtung des Zellwachstums entlang der in Pfeilrichtung orientierten Nanostrukturen auf dem Substrat.

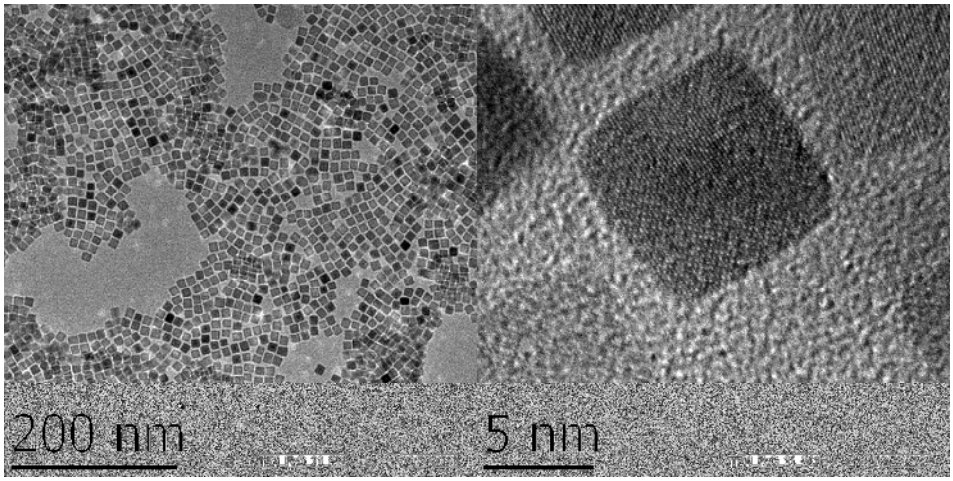


Direkte Transfektion von ausgerichteten CHO-Zellen auf nanostrukturieren Polyester-Folien. Oben links: GFP Fluoreszenz, unten links: Zellmarkierung, oben rechts: Phasenkontrast, unten rechts: Überlagerung aller Informationen.

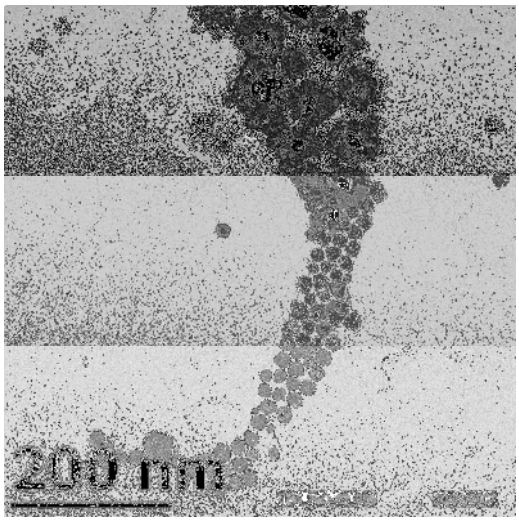


Zeitliche Entwicklung von Myoblasten-Anheftung und -Ausrichtung auf einer nanostrukturierten Polymer-Folie. Die zunehmende Ausrichtung entlang der Nanostrukturierungsrichtung ist deutlich zu erkennen.

Projekt NanoShape

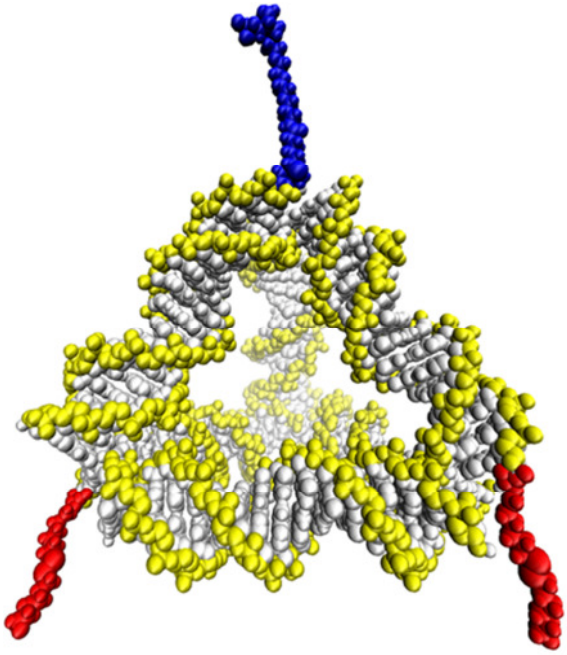


Chemisch synthetisierte Eisenoxid-Nanokristalle für magnetische Bauelemente und Tinten.

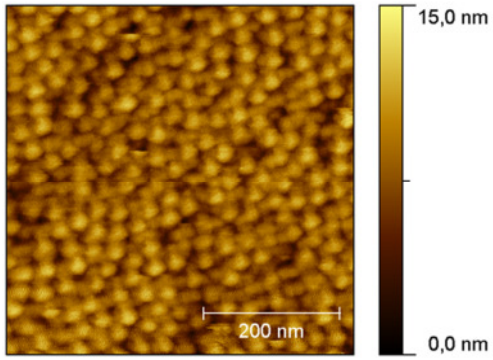


Mischung aus Au- und FeO- Nanokristallen. Die Au-Nanopartikel dienten bei der chemischen Synthese als Nukleationskeime für die Eisenoxid-Nanokristalle.

Projekt NABIOS

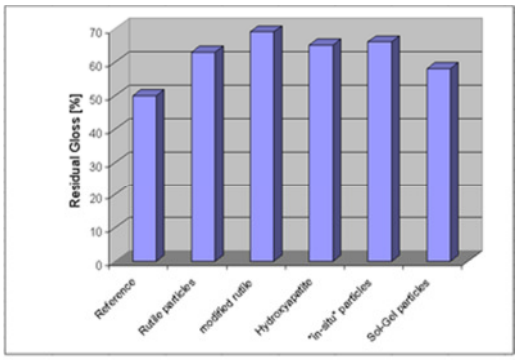


Schematische Darstellung eines Linker-Moleküls zwischen einem nanostrukturierten Substrat und einem zu untersuchenden DNA-Strang. Das Linker-Molekül selbst ist Tetraederförmig aus DNA-Strängen maßgeschneidert und besitzt an den unteren drei Ecken Thiolgruppen (rot), die auf Au binden, und an der oberen Ecke eine DNA-Sequenz (blau), die den zu untersuchenden DNA-Strang bindet.



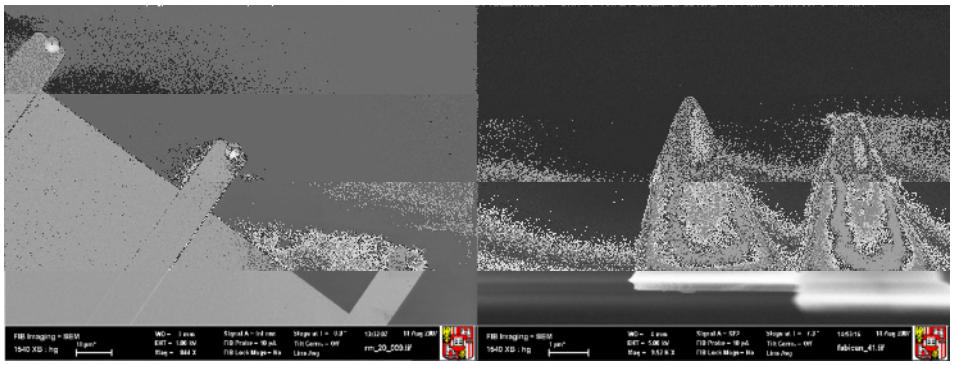
Dichte Anordnung von menschlichen Rhinoviren (Schnupfen-Viren), abgebildet mit dem Rasterkraftmikroskop (AFM). Ein Ziel von NSI ist es, einzelne Biomoleküle auf einem geeigneten nanostrukturierten Substrat zu lokalisieren und somit Detailuntersuchungen zugänglich zu machen.

Projekt NanoPow



Vergleich von Lacken, die durch unterschiedliche Nanopartikel gegen UV-Strahlung geschützt wurden. Der verbleibende Oberflächenglanz ist bei diesem normierten Alterungstest ein Maß für die Schutzwirkung gegen UV-Strahlung.

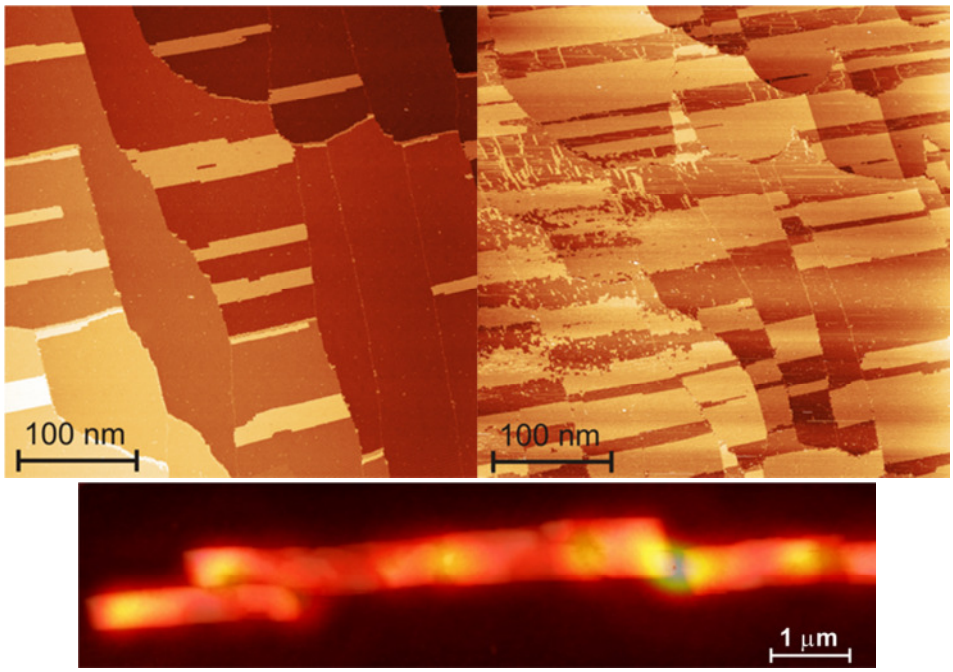
Projekt FABICAN



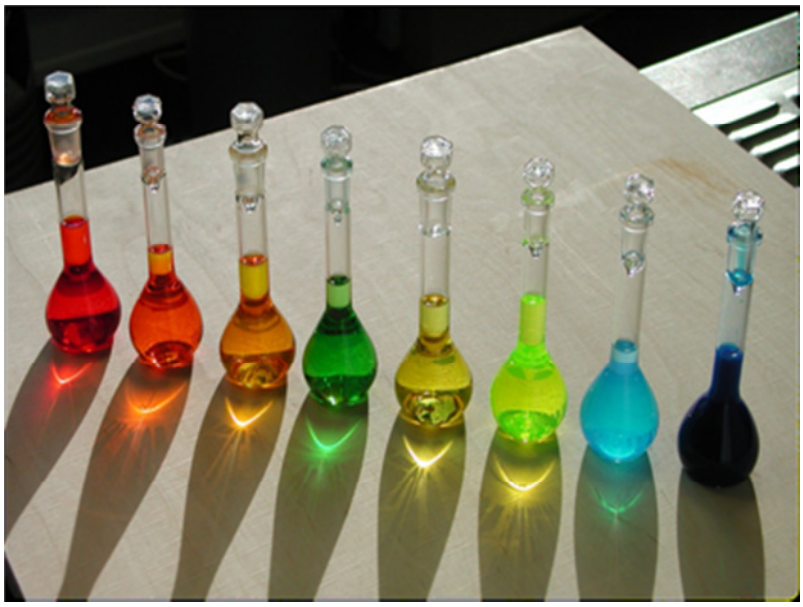
Neu entwickelte Meßaufnehmer für Rasterkraftmikroskope, die besonders schnelle und empfindliche Messungen erlauben. Verbesserungen der Abtastgeschwindigkeit um einen

Faktor zehn gegenüber herkömmlichen Aufnehmern konnten bereits demonstriert werden. Bild links: Draufsicht auf drei Meßaufnehmer; Bild rechts: Seitenansicht von Meßspitzen auf einem neu entwickelten, extrem dünnen Biegebalken.

Projekt MetClust



Projekt NanoInk



Events

Symposium on Nanostructured Surfaces and Interfaces

13 April 2012, Johannes Kepler Universität Linz, HS 15 (Managementzentrum)

The Austrian Nano Initiative was founded by the Austrian Research Promotion Agency FFG and the Austrian Science Fund FWF in 2004. Its main aim is to bring together basic and applied research in the field of nanoscience and nanotechnology with industrial exploitation. For this purpose highly innovative project clusters with partners from academic and corporate research institutions were selected in an international peer-review process. In total, more than 200 Austrian companies and research institutions are involved in the projects of the Austrian Nano Initiative. One of the project clusters entitled Nanostructured Surfaces and Interfaces (NSI) was coordinated by the Johannes Kepler University in Linz. It brought together most of the physics institutes at the Johannes Kepler University, two laboratories of Upper Austrian Research, and a substantial number of Austrian companies. With an overall budget of 8 M €, 6.6 M € of which having been funded by the Austrian Nano Initiative, and a total duration of seven years, NSI ended on schedule in February 2012. On this occasion, NSI organizes a Symposium on Nanostructured Surfaces and Interfaces, which brings together internationally renowned speakers and project partners from the NSI cluster project. The scope of the event covers the main topical fields of NSI, namely Bio-Nanotechnology, Nanocomposites and Nanoanalytics. The aim of the symposium is a dissemination of highlight results from the NSI cluster, which will be presented in the context of the international state of research in the respective fields of nanoscience and technologies.The Symposium on Nanostructured Surfaces and Interfaces takes place in the Management Center on the campus of the Johannes Kepler University in Linz on April 13, 2012. The symposium is open to the public.

A detailed program can be found **here**

17th International Winterschool on New Developments in Solid State Physics - Mauterndorf Winterschool

13 - 17 February, 2012 in Mauterndorf, Salzburg/Austria

For further information please see Link

XIV. Annual Linz Winter Workshop

February 3rd until February 7th, 2012 in Linz/Austria

For further information please see Link

For suggestions and requests please contact the NSI-Project Coordination

last modified March 16

Publications

NABIOS

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   Nanoscale DNA Tetrahedra Improve Biomolecular Recognition on Patterned Surfaces
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3. R. Zhu, S. Howorka, J. Pröll, F. Kienberger, J. Preiner, J. Hesse, A. Ebner, V. Ph. Pastushenko, H. J. Gruber and P. Hinterdorfer
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NBPF/PolyModEUV

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