Exhibition & Conference: nano tech 2011

nano tech 2011, the 10th International Nanotechnology Exhibition & Conference was held from February 16 to 18, 2011 at Tokyo Big Sight showcasing cutting-edge developments and applications in the field. This world’s largest nanotechnology event was also part of Japan’s “nano week 2011”, which comprised of 20 conferences and symposiums on nanotechnology. Website: http://www.nanotechexpo.jp/en/index.html

The exhibition attracted 46’502 visitors for the three-day fair including 8 concurrent exhibitions: InterAqua 2011, Nano Bio Expo 2011, ASTEC 2011, METEC 2011, Printable Electronics 2011, Convertech Japan 2011, neo functional material 2011 and Eco-cell Battery 2011. A total of 638 exhibitors, of which 448 were domestic and 190 were from 20 countries, were present in 754 booths.

From Japan, many governmental research institutions, including the National Institute for Environmental Studies (NIES), National Institute for Materials Science (NIMS), National Institute of Advanced Industrial Science and Technology (AIST), National Institute for Agrobiological Sciences (NIAS), and RIKEN, as well as laboratories of major universities, such as the University of Tokyo, Tohoku University, Keio University and Kyushu University, participated in the event. Big industry names (e.g. Toshiba Corp., Toray Industries Inc., NEC Corp. and many others) could also be found with their latest technologies.

A 10-year anniversary special showcase with the theme “Towards the next innovation with nanotechnology” illustrated how nanotechnology can contribute to an abundant lifestyle. Cosmetic products, an electric vehicle, LED lightening and a glass-less 3D television, all based on the use of nano technology, were on display.

Switzerland in the Top League

Separately, a nanotechnology chronological table tracking all inventions and discoveries, which contributed to the development of nanotechnology, was distributed to visitors of the show. Switzerland was mentioned in this table for the Nobel prize winning invention of the “Scanning tunneling microscope (STM)” by Prof. G. Binnig and Prof. H. Rohrer of IBM Zurich Research Laboratory et al. (1982), the development of the “Near-field scanning micro aperture optical microscopy within the visible range” by Prof. D. W. Pohl of IBM Zurich Research Laboratory et al. (1984), the invention of “atomic force microscope (AFM)” by Prof. G. Binnig of IBM Zurich Research Laboratory et al. (1986), the discovery of Nobel Prize winning “High-temperature superconductor” by Prof. J. G. Bednorz and Prof. K. A. Müller of IBM Zurich Research Laboratory (1986) and the proposal of “Dye-sensitized solar cell” by Prof. M. Graetzel of EPFL, et al. (1991). (http://www.nanotechexpo.jp/pdf/chronology2011_e.pdf)

The nanotech 2012 exhibition will take place in Tokyo from 15 to 17 February, 2012. As one of the nanotechnology founding nations, Switzerland should strive to capitalize on the success of SWISS Pavilion @ nano tech 2011 by again presenting a Swiss pavilion at nano tech 2012. Participation from academia and the private sector is crucial for Switzerland to present its excellence in nanotechnology. The SWISS Pavilion @ nano tech 2012 is already reserved and applications are very welcome. Inquiries to David Ziltener: david.ziltener@inno-x.ch.
SWISS Pavilion with Swiss Science Corner

Of the 20 countries and regions participating in nano tech 2011, those presenting their own pavilions were Switzerland, Belgium, Germany, Iran, Italy, Russia, Singapore, South Korea, Spain, Taiwan, U.S. and the UK. This year marked the 6th joint presence of Swiss exhibitors at the nano tech exhibition. Twelve participants were grouped under the roof of the SWISS Pavilion @ nano tech 2011. The Swiss Science Corner was the special zone in the Pavilion.

Swiss Science Corner
International cooperation and knowledge-transfer between countries remain to be seen as an important aspect of progressing R&D of new technologies in the world of nanotech and the significance is likely to increase. With this motivation, the Swiss Science Corner offered space to six participants from the R&D field in Switzerland. A total of 189 contacts were successfully established with visitors interested in Swiss nanotechnology. These valuable contacts are now being served with regular information and science news from Switzerland. In addition, the visitors have been given the “Nano- / Micro-Technology Digest of Switzerland”, which is in the attachment of this report.

ETH Micro and Nano Science Platform
- EPFL
- IBM Ruschlikon
- Nanograde
- Swiss Nanoscience Institute
- Swiss MNT Network

Further Participants
- BaselArea
- Lyncée Tec SA
- Micronarc
- Nanosurf AG
- Reishauer AG
- Star Coating Ltd.

Organized by:
- swissnanotech

Empowered by:
- Science & Technology Office Tokyo
- State Secretariat for Education and Research
- Inno-X GmbH

Partnered by:
- Osec Business Network Switzerland
- Lindt

A considerable number of industry professionals and academics visited the SWISS Pavilion during the three days of the exhibition. The common Swiss presentation helped produce more business meetings and expanded the opportunity to build new contacts, resulting in positive feedbacks from the participants.

The Swiss presence was also highlighted at the VIP reception where Switzerland was one of the few participants invited on stage to join the traditional celebration ceremony of “Kagami Biraki”.

Embassy of Switzerland in Japan
State Secretariat for Education and Research SER
Key Trend at nano tech 2011

For the third year in a row, nano tech 2011 endorsed the common theme “Green Nanotechnology” with the subtitle; Sustainability with every nanometer. Reflecting the increased awareness on environmental issues, there was much focus on nanotechnology as the base technology to create clean energy devices such as solar cells and fuel cells or for soil and water purification. There were nine presentations marked as “Green Nanotechnology Special Symposium”, which introduced how research organizations and industries are undertaking environmental issues.

Inno-X GmbH and Star Coating were included in the list of exhibitors with special emphasis on environment-related technologies and products, compiled by the exhibition organizer. A special link was provided on the official event website so that visitors could search for these “Green Nanotechnology exhibitors”.

Fuji Film was awarded this year’s “Green Nanotechnology Category Award” for the development of material solutions based on its competence in photographic technology built over many years. The company advances technologies as ITO–replacing transparent conductive materials, new coating concepts, honeycomb films for regenerative medicine and anti-aging cosmetics.

Nanotechnology and Materials Policy In Japan

Nanotechnology and material science in Japan remains to be among the highest levels in the world. They are considered to contribute in the progress of S&T and problem solving in fields such as life sciences, information and communications, environment, by forming important technology seeds that realize the development of industry, affluent lives for people and safe, assuring and comfortable society. “Nanotechnology and Materials Science” has been placed as one of the four principal priority areas to which R&D funds should be extensively allotted under the Third Science and Technology Basic Plan (2006-2010), together with the three other areas of “Life Science”, “Information Technology”, and “Environmental Science”.

According to the Ministry of Education, Culture, Sports, Science and Technology Japan (MEXT), there are five key areas within “Nanotechnology and Materials Science” that is being highly promoted by the ministries. One is Nanoelectronics. In this field, MEXT is promoting the development of logic devices that will overcome the limitations of silicon devices, information memory with over 100 times the memory density of conventional products, and element technologies for next-generation electron microscopes. Furthermore, the ministry is developing information and communication technology materials utilizing nanotechnology at the National Institute for Materials Science (NIMS). METI is developing nanoelectronics technology based on the operating principles of near-field optics to realize optical devices that include low-loss and high-function polarization control components.

In the field of bionanotechnology and biomaterial area, MEXT is establishing nanobiotechnology research bases that are open to the world. Furthermore, NIMS is developing biomaterials utilizing nanotechnology. The Ministry of Agriculture, Forest and Fisheries is working on the development of processing and assessment technologies for developing new food materials utilizing nanotechnologies. METI is developing molecular imaging equipment to detect functional changes in cells and detect cancer at a significantly early stage as well as devices that will be able to specifically target and treat cancer cells with pinpoint accuracy.

As for Materials, MEXT is promoting the strategy for rare elements to develop innovative catalysts for structural design and control at the nanoscale and technologies to scientifically elucidating roles of elements that determine the characteristics and functions of substances and materials to help ensure the replacement and reduction of using rare element. In addition, it also promotes fundamental R&D for breakthroughs in environmental technologies as part of the “Project: development of environmental technologies utilizing nanotechnology.” At NIMS, the ministry is also promoting R&D to increase the sophistication of environmental and energy materials as well as R&D of materials that are highly reliable and safe. METI is developing fundamental processing technologies related to welding and forging 4 technologies for structural control at the nanoscale to ensure further reliability, higher strength, and lighter weight by taking advantage of the special characteristics inherent to high-class steel products that have been structurally-controlled to that level.

In the area of promotion basis for nanotechnology/material fields, MEXT is preparing in anticipation of its shared use in FY 2011 of X-ray Free Electron Lasers, which enable instant observation and analysis of ultra-fine
structures at the atomic level and the ultra high-speed movements of chemical reactions. Furthermore, the ministry is promoting the commoditization of state-of-the-art research facilities and equipment owned by research institutions—such as universities and independent administrative institutions—through the “Nanotechnology Network” in an effort to promote research field integration that will produce achievement and spawn innovation. In addition, the ministry started to “develop research base networks to develop a low carbon society” to arrange research foundations to accelerate the industrialization of environmental technologies.

METI is promoting the project “Challenges for Nanotechnologies in Interdisciplinary Industries and Fields [literal translation]” to strengthen the vertical collaboration between upstream and downstream industries and cross-industrial and cross-field collaboration in an effort to improve the technical capacity and international competitiveness of Japanese industries. In addition, METI is also implementing the “development of advanced assessment standards for functional semiconductors” to clarify the impact of new materials used in semiconductor manufacturing on the functionality of finished products. The National Institute of Advanced Industrial Science and Technology (AIST), the National Institute for Materials Science (NIMS), the University of Tsukuba, and industry are working in collaboration to promote the formation of a world-class advanced nanotechnology research center in the City of Tsukuba.

In the Nanosciences/material science area, MEXT is implementing basic/fundamental research at RIKEN regarding the control and creation of nano-level physicality and functions, technological renovation of electronic materials by using cross-correlation of electrons, and basic research on nanoscale structural observation using light. Moreover, the ministry is implementing basic research in a wide range of fields at universities and independent administrative institutions. Major research subjects conducted in FY 2009 in the nanotechnology/materials field are as shown in the below table.

<table>
<thead>
<tr>
<th>Ministry</th>
<th>Research organization</th>
<th>Subject</th>
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<tbody>
<tr>
<td>Ministry of Internal Affairs and Communications</td>
<td>National Institute of Information and Communications Technology (NICT), etc.</td>
<td>- Research and development related to nano-ICT Ministry of Internal Affairs and Communications</td>
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</tbody>
</table>
| Ministry of Education, Culture, Sports, Science and Technology | | - Strategy for Rare Elements  
- Development of processing devices based on non-silicon device materials  
- Development of memory devices for ultrahigh density information  
- Founding of biotechnology research centers  
- Development of environmental functional catalyst based on nanotechnology  
- Development of microstructure-controlled materials  
- Development of nano-measurement/processing technologies for practical application (Development of next generation electron microscope element technologies) [literal translation]  
- Project for the creation of innovations for advanced research facilities (Nanotechnology Network)  
- Development of environmental technologies utilizing nanotechnology [literal translation] |
| National Institute for Material Science | | - Development of common fundamental areas in the nanotechnology field  
- Creation and nano-structural control of new materials on a nanoscale  
- Development of information and communication materials utilizing nanotechnology  
- Development of biomaterials utilizing nanotechnology  
- R&D for improving environmental/energy materials  
- R&D on materials ensuring high reliability and safety |
| RIKEN | | - Research for material function creation [literal translation]  
- Advanced optical science research [literal translation]  
- Molecule ensemble research  
- Research on dynamic hydration structures and molecular processes [literal translation]  
- Material creation research [literal translation]  
- R&D on an ultimate energy particle observation device [literal translation]  
- Research on clean chemistry [literal translation] |
| Ministry of Health, Labour and Welfare | Health and Labour Sciences Research Grants (Nano medicine research) | - Research on the application of nano-level imaging in healthcare  
- Research on the development of low invasive and non-invasive medical equipment [literal translation] |
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<tr>
<td>Ministry of Agriculture, Forestry and Fisheries</td>
<td>National Agriculture and Food Research Organization</td>
<td>- Development of technologies for nano-scale processing/evaluation of food material</td>
</tr>
</tbody>
</table>
| Ministry of Economy, Trade and Industry | National Institute of Advanced Industrial Science and Technology | - Project for development of alternate rare metal materials  
- Development of technologies for new nano-electronics semiconductor materials/new structures  
- Design of soft materials and development of functional materials [literal translation]  
- Development of energy-saving building materials [literal translation]  
- Development of nano-simulation technologies [literal translation]  
- R&D on large-scale synthesis of organic nano-tubes and their improvement [literal translation] |

Source: MEXT, White Paper on Science and Technology 2010

Appendix: Nano- / Micro-Technology Digest of Switzerland
Nano- / Micro-Technology Digest of Switzerland  
October 2009 – October 2010

High-Resolution Nano-Tomography
A novel nano-tomography method developed by a team of researchers from the Paul Scherrer Institute (PSI), ETH Zurich and the Technische Universität München (TUM), opens the door to computed tomography examinations of minute structures at nanometer resolutions. The new method makes possible, for example, 3-D internal imaging of fragile bone structures. This new technique will facilitate advances in both life sciences and materials sciences.
http://tinyurl.com/04-100923

Universal Law For Material Evolution
Many important materials are composed of several phases, regions that differ in structure or chemical composition. When such a material is heated, atoms move from one phase to another, which changes the distribution of the phases and thus, the properties of the material. Researchers from the Paul Scherrer Institute, Northwestern University and Risø National Laboratory for Sustainable Energy have now shown that for an important case, there is a general law describing this process that is valid for all classes of materials, including metals and polymers. They found that the shape of the interfaces during break-up becomes universal, no matter what material is used. This sort of universality allows them to predict the dynamics of the break-up process in a vast array of materials.
http://tinyurl.com/04-100804

High-Tech Clothing For Solar Impulse Pilots
When it gets cold, birds fluff up their coat of feathers; the air pockets between the feathers serve as an insulating layer and protect them from the cold. Conversely, when it gets warm, birds bring their feathers in close to their bodies. Empa researcher Markus Weder and his team copied this behavior from nature to develop a textile-based innovation, the vAIRis System (“variable insulation system”). This patented invention allows the production of down jackets whose insulating properties can be varied. This development also serves as the basis for the pilot’s suit for Solar Impulse.
http://tinyurl.com/04-100816

Ceramic Foam For Insulation
The Institute for Non-metallic Inorganic Materials at ETH Zurich develops ceramic foams intended for use as energy-efficient thermal insulations in blast furnaces, as bone substitutes and for the controlled release of active ingredients in medicine. Urs Gonzenbach has developed highly porous ceramic foams that have significant advantages over conventional porous ceramics. They are up to 50% lighter, have a thermal conductivity that is about 30% lower and at the same time are twice as strong. The material owes these properties mainly to its porous microstructure which consists of tiny air inclusions, keeping the ceramic foams stable for several days.
http://tinyurl.com/04-100826

New Radar Absorbing Surface
Researchers from ETH Zurich's Institute for Field Theory and High Frequency Electronics have developed new surfaces that can absorb radar radiation over an extremely broad range. Thanks to this multifaceted application, window panes could even double up as solar panels. Moreover, only being a few millimetres thick, the perforated plates are cheap and easy to make.
http://tinyurl.com/04-100831
Electronics Integrated To Textile

Electrical engineers at ETH Zurich have developed an intelligent material where cotton, sensors and conductive fibers are sewn together. The textile can be mass produced and also washed. The group of Prof. Gerhard Tröster was able to integrate thin-film electronics and miniaturized chips onto plastic threads. This new way of mixing electronics and textile can be produced using normal industrial techniques.  
http://tinyurl.com/04-100702

World’s Smallest Syringe

Scientists from the Swiss Center for Electronics and Microtechnology (CSEM) and Lund University have successfully developed antibody microarrays. Each individual spot of the array has a level of miniaturization that has never been achieved before (nanometer scale). Antibody microarrays enable the analysis of the presence of multiple biomolecules, typically proteins, and have applications in the detection of disease-related biomarker signatures. NADIS, short for Nanoscale Dispensing, was developed to deposit liquid volumes as small as attoliters (10^-18 liters). Another key application of this nanoscale liquid-delivery technique technology was already demonstrated when tiny amounts of liquids were injected into living cells. This pioneering work makes NADIS the smallest syringe in the world.  
http://tinyurl.com/04-100707

Watch Making Expertise Combined

The Swiss Center for Electronics and Microtechnology (CSEM) and the Haute Ecole Arc Ingénierie have joined forces in the watchmaking arena by signing a framework agreement on cooperation. This move represents a merge of technical and scientific expertise in the area of microtechnology in the service of watchmaking, covering the entire Neuchâtel region. With this partnership, CSEM and the HE-Arc Ingénierie will reinforce the innovation process by disseminating new technologies to industry. CSEM will contribute to this partnership with its multidisciplinary skills in microsystems technology, precision mechanics and robotics. The HE-Arc Ingénierie will contribute with its state-of-the art expertise in the conception and design of watchmaking movements and components and will also act as a specialist in multi-body simulations and in the development of tools for designing non-circular gears.  
http://tinyurl.com/04-100713

Carbon Nano Tubes As Transistor Building Block

Researchers from ETH Zurich have built a new transistor where a Carbon NanoTube (CNT) with outstanding properties hangs above the two contact points. Scientists succeeded in avoiding impurities in the CNT during the fabrication process and were therefore able to assemble the components of the transistor without gate hysteresis. The tip of the CNT was even coated with palladium to improve electrical contact. This opens the way for the production of nanosensors and electro mechanical components that require very few energy.  
http://tinyurl.com/04-100715

Benefits And Potential Risks Of Nanomaterials In Paints

Nanomaterials have a positive effect when covering a façade as they can slow down the deterioration, caused by UV radiation, and prove to be a good alternative to the biocide problem. In addition, nanoparticles allow the production of innovative products for heat insulation and self-cleaning surfaces. Empa has launched, in cooperation with industrial partners, the “Nanohouse” project that studies the technology transfer feasibility by analyzing the benefits and potential risks of nanotechnological coating throughout the life cycle of a product, focusing particularly on the release of nanoparticles from the coating and their behaviour once freed in the environment.  
http://tinyurl.com/04-100720
Graphene Nanoribbons For Transistors

Scientists from Empa, the Max Planck Institute for Polymer Research, ETH Zurich and the Universities of Zurich und Bern have managed for the first time to grow graphene ribbons that are just a few nanometres wide using a simple surface-based chemical method. Graphene ribbons are considered to be «hot candidates» for future electronics applications as their properties can be adjusted through width and edge shape. Graphene consists of 2-D carbon layers and possesses a number of outstanding properties. Graphene is harder than diamond, extremely tear-resistant, impermeable to gases and it is also an excellent electrical and thermal conductor. The newly developed method allows to create graphene ribbons with band gaps, which can be further used as switches. [source]

New Nanotech Research Center

The new CHF 90-million nanotechnology research center of IBM in Zurich will be ready at the end of the year on the shores of lake Zurich. The center is dedicated to basic research in confined environments where very delicate experiments will be conducted. For example, some laboratories will be vibration-free, shielded against electromagnetic radiation and the temperature will be regulated to a 0.1°C precision. In clean rooms, micro and nano structures will be developed in solid materials. ETH Zurich, as co-financing institution, will have access to the cutting-edge laboratory facilities. Empa will also be collaborating in different projects. [source]

Promising High-Temperature Superconductors

Researchers under the supervision of Prof. Bertram Batlogg from ETH Zurich have grown superconductive crystals from different elements of a special type of high-temperature superconductors. They have studied the causes of superconducitivity in these crystals and measured critical electric and magnetic fields that inevitably break the superconductive states. Results for the developed materials are promising. [source]

Nano Structured Surfaces For More Efficient Solar Cells

Empa researchers have succeeded in growing sea-urchin shaped nanostructures from minute balls of polystyrene beads using a simple electrochemical process. The spines of the sea urchin consist of zinc oxide nanowires. The structured surface should help increasing the efficiency of photovoltaic devices since it is expected to have excellent light scattering properties. This means the surface will be able to absorb significantly more sunlight and therefore be able to convert radiated energy into electricity more efficiently. This process also benefits from the fact that polystyrene is cheap and ubiquitous. [source]

Polymer Semiconductors

Semiconductors made from polymer materials are becoming increasingly important for the electronics industry as a basis for transistors, solar cells or LEDs, showing important advantages when compared to conventional materials. They are lightweight, flexible and very cheap to produce. In order to find the optimal material, one has to know how different polymers mix together and how the various components contribute to the properties of the material. Researchers from the Paul Scherrer Institute and the University of Cambridge have developed a method that allows them to determine the detailed structure of the material within a blend, both in the bulk and on the surface. [source]
Boosted Supraconductivity In Nanostructures

An international team of researchers led by Prof. Klaus Kern at EPFL has shown that so-called quantum size effects can stimulate supraconductivity in nanostructured materials. Experiments using tin have proved a 60% increase in the supraconductivity gap for quantum effects. This discovery opens new perspectives in nanostructured materials.

http://tinyurl.com/04-100610

"Intelligent Material" Program Launched

Intelligent materials have a considerable innovation potential that Switzerland’s industry could make available for the future. The National Research Program NRP 62 will act as a co-operator between the Swiss National Science Foundation (SNSF) and the Innovation Promotion Agency CTI. Such kinds of material can change their properties if externally stimulated and return to their initial state when the stimulation is halted. Room for innovation is important, especially when combined to intelligent structures and systems. Institutes such as EMPA, ETH Zurich, EPFL and cantonal universities will focus on a panel of 21 selected projects, ranging from surgery tools to catalysters and instruments for the measurement of blood sugar, etc.

http://tinyurl.com/04-100617a

Organic Nanowires To Build Electronic Components

Empa researchers have developed a new method to synthesize complex organic nanowires and connect them conductively to form a circuit, with the perspective of constructing electronic and optoelectronic components. They are promising candidates for the fabrication of cheap, large and flexible optical and micro- & nano-electronic technical parts such as transistors, diodes and sensors. Scientists can now manufacture nanowires – 10 to 50 nm in diameter and 100 μm long – with different properties. These wires can then be assembled in networks.

http://tinyurl.com/04-100617b

World’s Smallest Coding Device

The Electronic and Microelectronic Lab of the Engineering and Management School VD (HEIG-VD) has developed an integrated circuit in a submicron technology for the POSI SA firm. The aim of this project is to have an inductive micro system for the measurement of position. POSIC SA already produces inductive sensors based on micro spools integrated onto silicon. The final product corresponds to the world’s smallest inductive coding device, insensitive to magnetic fields, robust against miscellaneous contaminations and yielding a position measurement with a sub micron precision.

http://tinyurl.com/04-100618

Lighter And Stronger Reinforced Composites

A new technology from ETH Zurich allows to control the orientation of reinforcing elements in polymer-based advanced composites. The process relies on the use of magnetic nanoparticles to enable the orientation of non-magnetic reinforcing particles (e.g. fiber, rods) in a fluid, followed by the consolidation of the aligned structure. Composite materials with reinforcing particles embedded in a matrix material are extensively used in construction, aerospace, automobile and medical industries. Though this reinforcement enhances the mechanical strength and stiffness of the matrix, it is limited to one specific direction. It results in a ten-fold increase in compression stiffness perpendicular to the film surface and a local control to reinforce regions of high stress concentration.

http://tinyurl.com/04-100628
Leading-Edge Research In Infrared Chemical Sensing

The EU has awarded a grant of EUR 2.8 million to the project PLAISIR (Plasmonic Innovative Sensing in the Infrared) led by the Center for Electronics and Microtechnology (CSEM). The goals of the project are to create ultra-sensitive chemical sensors and smarter, cheaper infrared (IR) photodetectors. Developments will also enhance Spectroscopic Chemical Sensing (SCS) systems to help detect CO$_2$ and glucose. In addition, the advances in technology will help developing better IR cameras. Nanotechnology will be used as it has the ability to confine and control light at both wavelength and sub-wavelength scales through a phenomenon known as plasmonics.

http://tinyurl.com/04-100630

New Material Based Socks To Prevent Blisters

Empa researchers and experts from armasuisse have developed novel socks which reduce the chances of blisters forming on the wearer’s feet. The prototype footwear, made of various fibers, reduces friction at the toes and heels, absorbs perspiration and has a particularly comfortable feel. The researchers chose to make the material used for the heel and toe sections of the socks out of a special fiber, while the rest of the garment is made of a woolen mixture which absorbs dampness particularly well.

http://www.empa.ch/plugin/template/empa/3/94384/---/l=2

Material Science Award

For the fifth time, materials scientist Sara Morgenthaler from ETH Zurich’s Materials Research Center teamed up with a committee of PhD students to organize a graduate symposium for budding young researchers in materials research. The idea of the symposium is to encourage the exchange of ideas between the young researchers. Whilst they all work with materials, their research fields and backgrounds are various, ranging from physics, chemistry to engineering. Marta Bally, Anja Hänzi and Thomas Helbling share the first Materials Research Award to be presented at ETH Zurich, which they received for their outstanding research during their dissertations.

http://www.ethlife.ethz.ch/archive_articles/100511_MRC_Symposium_su/index_EN

Selection of National Research Program On Nanomaterials

The call for proposals published in the context of the National Research Programme “Opportunities and risks of nanomaterials” (NRP 64) received a total of 44 outline proposals for a total of CHF 21,1 million. The NRP 64 has approximately CHF 7,5 million to fund projects for a initial duration of three years. Foreign external experts and the members of the steering committee evaluated the applications according to their scientific quality and their relevance to the goals of the programme. Based on these deliberations the Steering Committee selected to invite 21 applicants to submit full proposals (CHF 8,0 milion). A total of 23 projects could not be taken into account.


Life Sciences & Nanotech Platform

The Swiss Biotech Association (SBA) identified industrial and academic players as well as issues within the field of nanotechnology and life sciences to create the Nanotech Platform. The aim of these events is the gathering of ideas and the further identification of mutual interests that are important to this industry segment. Innovative ideas might be furthered with industry-industry or academic-industry projects. The next nanotechnology platform planned at IBM Forum Zurich Research will cover the topics “Lab-on-a-Chip” and “Drug Delivery”. With some 3000 scientists, SBA is the largest industrial IT research organization in the world.

Smart Materials Projects Approved

The Swiss National Science Foundation (SNSF) has approved 21 research projects for the National Research Programme “Smart Materials” (NRP 62), with available funding totalling 6.6 million Swiss francs. At the beginning of last year, researchers submitted a total of 79 pre-proposals, the majority of which were assessed by the NRP 62 Steering Committee as being of a high standard.


Reinforced Cotton With Boron

Researchers from Switzerland, the United States and China have discovered that cotton can be transformed into a material that is extremely tough as well as flexible. What scientists have done is to combine the carbon in the shirt’s cotton with boron – the third-hardest material on earth. The result is a lightweight shirt reinforced with boron carbide, which is used to protect tanks. The research is a conceptual change in fabricating lightweight, fuel-efficient, super-strong and ultra-tough materials that offered unprecedented opportunities. The result is a fabric that is lightweight but tougher and stiffer than the original T-shirt. And it is still flexible, an improvement over the current boron-carbide plates used in bullet proof vests and body armor.

http://www.ethlife.ethz.ch/archive_articles/100407_nano_baumwolle_per/index_EN

Stable Magnetic Nanoparticles For Biomedical Applications

Stabilization of magnetic nanoparticles used as contrast agents in biomedical imaging such as Magnetic Resonance Imaging (MRI) and for magnetic targeting and therapeutics is a daunting problem without a solution to date. Anchor groups for dispersants were developed at ETH Zurich which lead to ultra-stable nanoparticles under physiological conditions and at elevated temperatures. The resulting stable shells enable additional functionalization for targeting and multimodal imaging. The latter can be achieved by coupling e.g. fluorophore, Positron Emission Tomography (PET) or Single Photon Emission Computed Tomography (SPECT) labels to the iron oxide cores.

http://www.switt.ch/files/technologien/stable_magnetic_nanoparticles_for_multifunctional_biomedical_applications_t09_057.pdf

Record Fast Switching, Low Power Transistors

Transistors, the cornerstone of electronics, are lossy and therefore consume energy. Researchers from the ETH Zürich and EPF Lausanne have developed transistors targeting high switching speeds and higher output powers. The devices can be used more efficiently as conventional transistors, so as to reduce energy consumption and CO2 emissions. Instead of using Aluminium-Gallium Nitride, the researchers exploit the favorable properties of a newer material combination consisting of Aluminium Indium Nitride (AlInN/GaN). They managed to break their own record of 102 GHz by increased the cutoff frequency by 41 percent up to 144 GHz in a single step.

http://www.ethlife.ethz.ch/archive_articles/100419_transistor_bolognesi_su/index_EN

Luminescent Nanoparticles To Detect Fingermarks At Crime Scene

Andy Becue is working as an assistant lecturer at the School of Criminal Justice of the University of Lausanne. His research aims at developing new methods to detect finger marks, based on the use of luminescent nanoparticles. The challenge of this research consists in finding a way to graft these nanoparticles onto the secretion residue that are left on a substrate after someone touched it. The luminescence of one nanoparticle can be equivalent to more than 10 000 dye molecules. Using this method, it will be possible to go beyond the current sensitivity limits, and to detect finger marks that can not be detected nowadays. Another research strategy could consist in targeting DNA or blood, on garments for example, using such functionalized and luminescent nanoparticles.

http://www.projectdb.snf.ch/WebForms/ProjectDetail.aspx?ID=f4299af-4f31-4cbf-b7b9-3d7519ccf3e6
New 3D Microscopic Technique For Nanoscale Structures And Devices Manufacturing

IBM scientists have created a 3D map of the earth so small that 1,000 of them could fit on one grain of salt. The scientists accomplished this by means of a new, breakthrough technique that uses a tiny, silicon tip with a sharp apex — 100,000 times smaller than a sharpened pencil — to create patterns and structures as small as 15 nanometers at greatly reduced cost and complexity. This patterning technique opens new prospects for developing nanosized objects in fields such as electronics, future chip technology, medicine, life sciences, and opto-electronics.


Second Call For EuroNanoMed

Following the success of the 1st Call in 2009, EuroNanoMed is launching its 2nd Joint Transnational Call for funding of innovative research projects in Nanomedicine. Proposals can address the three subfields regenerative medicine, diagnostics, targeted delivery systems.


3D Chip Stacking To Preserve Moore’s Law

More than 50 years old, Moore's Law is still in effect, but to extend it as long as 2020 will require a change from mere transistor scaling to novel packaging architectures such as so-called 3D integration, the vertical integration of chips. Unlike current processors, the CMOSAIC project considers a 3D stack-architecture of multiple cores with an interconnect density from 100 to 10,000 connections per millimeter square. Researchers believe that the tiny connections and the use of hair-thin, liquid cooling microchannels measuring only 50 microns in diameter between the active chips are the missing links to achieving high-performance computing with future 3D chip stacks.

http://tinyurl.com/04-100309

World’s Smallest Microlaser

ETH-Zurich physicists have developed a new kind of laser that shatters the boundaries of possibility: it is by far the smallest electrically pumped laser in the world and one day could revolutionize chip technology. It's 30 micrometers long, eight micrometers high and has a wavelength of 200 micrometers, making the laser considerably smaller than the wavelength of the light it emits. Instead of the usual optic resonators, an electrical resonant circuit made up of an inductor and two capacitors was used. This means the size of the resonator is no longer limited by the wavelength of the light and can in principle be scaled down to whatever size one wants. This prospect especially makes the microlaser interesting.

http://tinyurl.com/04-100319

Risk Matrix For Nano-Materials

The advantage of nanomaterials is that they possess properties different to those of the same material in “normal” size. However, the newly-emerging technology also harbours potential risks. Up to now, there is still very little known about the way synthetic nanoparticles act on living organisms over a prolonged period of time. Researchers developed a precautionary matrix for synthetic nano-materials. Close collaboration between different groups has now produced the precautionary matrix, which classifies the substances based on their harmfulness and application. The classification involves assessing the specific framework conditions, the potential for effect, human exposure and environmental pollution by nanoparticles.

http://tinyurl.com/04-100325
First Swiss Nanotech Report

Nanotechnology is widely considered a rapidly developing and, from an economic point of view, increasingly important field of technology. Swiss scientists and engineers were and are pioneers in the miniaturization of processes and structures, which shows in the early upswing of nanotechnology related patent applications from Swiss inventors and applicants. The country consistently ranks among the leaders in terms of innovation activity, as evidenced by the high number of patent applications per capita. Although groundbreaking manipulation techniques, such as the scanning tunneling microscope and the atomic force microscope, were developed in Switzerland, nanotechnology activities have clearly extended into other segments.

http://tinyurl.com/04-100201

Nanosized Wear-Resistant Carbon Tip

Researchers at IBM Research-Zurich, the University of Pennsylvania and the University of Wisconsin-Madison have fabricated an ultra sharp, diamond-like carbon tip that is 3,000 times more wear-resistant at the nanoscale than silicon. The end result is a diamond-like carbon material mass-produced at the nanoscale that doesn’t wear. Molded into the shape of a nanosized tip and integrated on the end of a silicon microcantilever for use in atomic force microscopy, the material has technological implications for atomic imaging, probe-based data storage and as emerging applications such as nanolithography, nanometrology and nanomanufacturing.

http://tinyurl.com/04-100225

Nanotechnology Has Big Potential

Nanotechnology, a science dealing with minute particles, has huge potential for Switzerland, according to a recent report. The first ever Swiss Nanotech Report into the domestic industry was not yet able to come up with figures for the present situation, but experts agreed the country played a leading global role. Nanotechnology is the manipulation of atoms and molecules, with one nanometer being around one millionth the diameter of a pinhead. The discipline, which crosses the fields of chemistry, physics and biology, is already used in items ranging from sunscreens, where particles makes the cream more transparent, to minuscule computer chips.

http://tinyurl.com/04-100121

New Record In Magnetic Tape Density

IBM researchers today announced they have demonstrated a world record in areal data density on linear magnetic tape — a significant update to one of the computer industry’s most resilient, reliable and affordable data storage technologies. This breakthrough proves that tape technology can increase capacity for years to come, which has important implications, as tape storage systems are more energy efficient and cost-effective than hard disk drive storage systems.

http://tinyurl.com/04-100122

EuroNanoMed Supported By Switzerland

A panel of international experts has recommended to support 8 out of 26 projects submitted in response to the first call within the ERA-Net EuroNanoMed. Swiss partners are involved in 3 of the supported projects. The Swiss National Science Foundation (SNSF) will support the Swiss sub-projects with a total amount of CHF 875’000 for 3 years.

http://tinyurl.com/04-100126b

Concrete Enhancement Using New Fiber

Concrete can be thought of as synthetic stone, and is of course frequently used as a building material. Whilst concrete, when cured, can withstand high compressive loads, it fails when subjected to even low tensile forces. Concrete first became useful as a building material when this disadvantage was overcome by the use of steel reinforcing, taking up any tensile loads. Josef Kaufmann, Joern Luebben and Walter Trindler together with fiber specialist
Eugen Schwitter of industrial partner fibrotec, have developed a novel fiber made of two different synthetic materials which when used with concrete gives the building material additional ductility.

http://tinyurl.com/04-091217

**Nanotechnologies Highly Supported By Switzerland**

(Nano-tera.ch, December 21, 2009)

Nano-tera.ch, the Swiss initiative in engineering sciences, will invest with involved partners around 45.6 million CHF in the coming next three years for the nine newly selected Research Technology and Development (RTD) projects. All the projects were scientifically evaluated by the Swiss National Science Foundation. An international renowned panel of experts finally selected nine projects based on the following criteria: scientific quality, the originality and the feasibility in the frame of the initiative.

http://tinyurl.com/04-091221

**Micro Fluidic Chip Technology**

(IBM Research Zurich, November 17, 2009)

Zurich scientists Luc Gervais and Emmanuel Delamarche in collaboration with the University Hospital of Basel in Switzerland have developed a new diagnostic test that uses capillary forces to analyze tiny samples of serum or blood for the presence of disease markers. Capillary action is the tendency of a liquid to rise in narrow tubes or to be drawn into small openings. The innovation is based on a chip made of a silicon compound, similar to those used in computer chips, thus leveraging IBM's vast experience in developing and manufacturing silicon semiconductor wafers. The chip, which measures 1 × 5 centimeters, contains sets of micrometer wide channels where the test sample flows through in approximately 15 seconds, several times faster then traditional tests. The results are so quick and accurate that a patient’s serum or blood sample, could be tested immediately following a heart attack to enable the doctor to take a course of action and to predict the patients survival rate.


**Graphene-Like Polymer With Atomic Accuracy**

(Empa, November 19, 2009)

Physicists at Empa, together with chemists from the Max Planck Institute, for the first time, succeeded in synthesizing a graphene-like porous polymer with atomic accuracy. The researchers allowed chemical building blocks of functionalized phenyl rings to “grow” spontaneously into a two-dimensional structure on a silver substrate. This created a porous form of graphene with pore diameters of a single atom and pore-to-pore spacings of less than a nanometer. In the “bottom-up” technique based on molecular self-assembly the molecular building blocks join together spontaneously at chemically defined linking points to form a regular, two-dimensional network. This allows graphene-like polymers to be synthesized with pores which are finer than is possible by any other technique.

http://www.empa.ch/plugin/template/empa/3/89763/---/l=2

**Silicon Metal-like Technology**

(Empa, October 08, 2009)

Silicon, the most important semiconductor material of all, is usually considered to be as brittle and breakable as window glass. On the nanometer scale, however, the substance exhibits very different properties, as Empa researchers have shown by creating minute silicon pillars. If the diameters of the columns are made small enough they yield to the pressure and undergo plastic deformation, as a metal would. This discovery opens the way for completely new design techniques from a materials point of view for mechanical microsystems and in the watch industry. Results show that it might be possible to use silicon like a metal in mechanical applications. Metallic materials are fault tolerant and are capable of absorbing shock loads by deforming without breaking.

http://www.empa.ch/plugin/template/empa/3/88033/---/l=2

**"Mushroom Violin" Challenges Stradivarius**

(Swissinfo, October 21, 2009)

"Mushroom Violin" Challenges Stradivarius

The wood protection/biotechnology group at the Swiss Federal Laboratories for Materials Testing and Research (Empa) and a violin maker are revolutionizing the design of violins by using wood that has been treated with filamentous fungi. This makes the wood lighter by reducing its thickness, since they decompose the wood cells from the inside, thus making the cell walls thinner. This has a direct influence on the wood's acoustic properties. In addition the filamentous fungi re-open the cell membranes – the link to the exchange of...
material between cells, which with dead wood is blocked. As a result the sound can permeate the wood more quickly and so sounds more harmonious.

http://tinyurl.com/yjvcnfn

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