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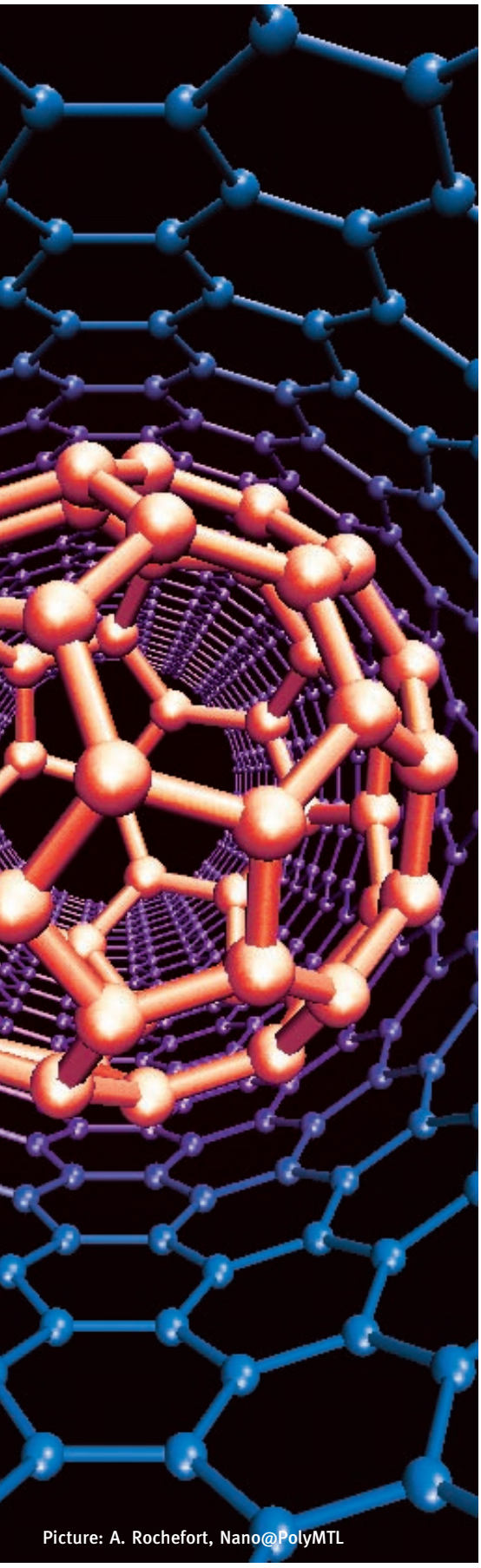

Picture: A. Rochefort, Nano@PolyMTL

Devices and applications

"Nanodog" Detects Explosives

Scientists from the School of Chemistry at the University of Wales, Bangor (UWB) have developed a biosensor, referred to as the "nanodog", which is capable of detecting and identifying explosives in the atmosphere, even when concealed. Enzymes are used for identifying the target molecules, and the detection limit is as high as the parts-per-trillion range. With support from the Welsh Assembly Government, the team has developed the biosensor, patented the technology, and is currently working towards a prototype for commercialization. Potential applications include screening airport passengers and luggage and working alongside sniffer dogs. The biosensor team has also been invited to participate in a € 10.4 M EU project that commences in the autumn, which is aimed at developing an integrated system for security in public places. The UWB will be a major partner in the development of sensors for explosives with their biosensor, which brings together a consortium of 26 EU organizations including various industries and border and customs control agencies. For further information, please visit www.chemistry.bangor.ac.uk/nanodog.php

Products and patents

Bonding and "Debonding" On Command

Researchers from Degussa AG and the Fraunhofer Institute for Manufacturing Engineering and Applied Materials Research (IFAM) in Bremen (Germany) have developed adhesives that contain the nanostructured MagSilica filler. Stimulated in the high-frequency field, the adhesive hardens immediately without any exposure to external heat sources. Likewise, the adhesive connections can be detached at the touch of a button. A powder of superparamagnetic particles is mixed into the adhesive; these particles consist of iron oxide embedded in nanoparticles of silicon dioxide. When the adhesives are exposed to a high-frequency alternating magnetic field, the particles oscillate and heat the adhesive. This causes both one- and two-component adhesives to harden within seconds. To dissolve the bonds, the adhesive is exposed to a high-frequency magnetic field with the same frequency but a higher intensity. For the method to work, at least one of the components to be bonded must be electrically nonconducting. The scientists were able to demonstrate the principle on various combinations of materials and different adhesive base formulations. For further information, please visit www.fraunhofer.de/fhg/EN/press/pi/

Reports

Nanometrology

The latest Nanoforum report, published in July of this year, provides information on the field of nanometrology, that is, the science of measurement at the nanoscale. The tools and techniques that are being developed in this field will enable a greater understanding of the relationship between size and physical properties. Apart from its central role in fundamental nanoscience research, metrology underpins international standards and so is critical to the success of nanotechnology-enabled products. These products will include new materials for electronics, health and medicine, transport, energy, construction, and consumer goods. This report details and explains the purpose of the tools and techniques that are being developed to measure material properties at the nanoscale. It also lists key European organizations that are contributing to the development of nanometrology. This report is available for free download at www.nanoforum.org

Education

Time to Study Nanoengineering

The Faculty of Engineering in collaboration with the Faculty of Physics at the University of Duisburg–Essen is of-

fering an interdisciplinary Bachelor/Master study course in Nanoengineering, which is unique in Germany. The aim of this study course is to qualify the students for a profession in the highly interdisciplinary field of nanotechnology. This will be realized by a balanced combination of fundamental research and specific courses dealing with topics in nanotechnology. The course focuses not only on nanoengineering, but also on nano-(opto)electronics, and includes aspects relevant to all disciplines of the natural sciences and engineering, such as electrical and mechanical engineering, physics, and chemistry. The registration period begins in September and runs until October 13th. For further information please visit: www.uni-due.de/nanoengineering

Devices and applications

Order by Motion

Scientists at the Max Planck Institute of Colloids and Interfaces in Potsdam (Germany) have recently shown that molecular motors can induce orientational order in an isotropic liquid of filaments. The researchers have proposed a simple biomimetic model system for the creation of spatial order by increased molecular motion. The system consists of molecular motors anchored to a substrate surface in contact with an isotropic liquid of cytoskeletal filaments. As the density of the molecular motors is increased, this liquid is predicted to undergo a phase transition towards a nematic liquid crystal with long-range orientational order (see Figure 1). This ordering effect arises from the interplay of motor activity and steric filament interactions, a mechanism that should also be effective for the pattern formation processes in living cells. For further information, please visit: www.maxplanck.de/english/contemporaryIssues/news/

P. Kraikivski et al., *Phys. Rev. Lett.* **2006**, *96*, 258 103

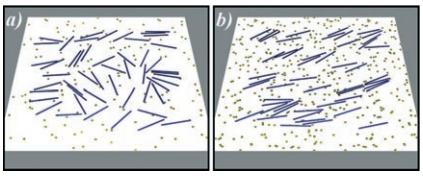

Figure 1. Two snapshots of rodlike filaments (blue) on a surface coated with immobilized molecular motors (yellow): a) At low motor-surface density the filaments display no order; b) above a threshold value for the motor density, the filaments spontaneously order into a parallel pattern. This image was reproduced from http://www.maxplanck.de/english/illustrationsDocumentation/documentation/pressReleases/2006/pressRelease20060724/index.html

Funding

Nanocomposite Polymer for Medical Devices

A team of scientists from University College London (UCL) has developed a new biomaterial for use in medical devices for applications including bypass grafts, liver transplants, and plastic surgery. The team claims that the material offers great potential for the development of human organs with the aid of stem-cell technology. The ongoing work is funded by two Engineering & Physical Sciences Research Council (EPSRC) grants that were awarded this year. The first, from the EPSRC Healthcare Engineering Panel, is a three-year program worth £ 200 000 and focuses on the development of a new prototype working design of a heart valve for use in children. It is hoped that in vivo trials and possibly some limited clinical trials can begin before the end of the project. The key material for this application is a unique biocompatible nanocomposite developed at the Biomaterials & Tissue Engineering Centre, UCL Surgery, which will be processed and formed using electrohydrodynamic jetting. The second grant was awarded by the EPSRC Engineering Functional Materials Flagship Programme and is a four-party collaborative research project led by UCL and involving Oxford University, the University of Manchester, and Imperial College London. The five-year grant, totaling £ 1.1 M, is to fund investigations into stents made of new functional nanocomposites (see Figure 2). The grafts will be made from either a shape memory alloy with a nanocomposite coating or entirely from a radio-opaque shape memory nanocomposite. Successful development might lead to the production of a stent that has significant advantages such as a more reliable expansion mechanism, higher radial strength, the ability to shape the structure to the artery, and better biocompatibility with both blood and tissue. For further information, please visit: www.ucl.ac.uk/news/news-articles/06062802

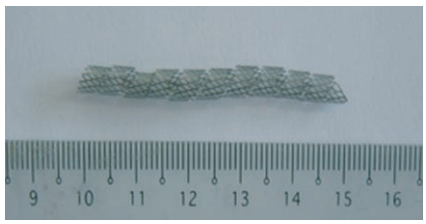

Figure 2. Mesh stent made from the new biomaterial. This image was reproduced from www.ucl.ac.uk/news/news-articles/06062802

Upcoming events

Nanoscience at Surfaces

The tenth International Symposium on Nanoscience at Surfaces (ISSP-10) will take place from October 9–13, 2006 in Kashiwa (Japan) and is organized by the Institute for Solid State Physics (ISSP) at the University of Tokyo. The conference will focus on the physical and chemical properties of nanostructures on surfaces and their fabrication processes. Research activity in this field has been growing very rapidly, taking advantage of the accumulated knowledge in surface science. It is expected that the researchers attending this symposium will report new advances in this field, exchange novel ideas, and discuss directions for new research. Among the Advisory Committee are Masakazu Aono (Japan) and Flemming Besenbacher (Denmark), both members of *Small*'s Editorial Advisory Board. For further information, please visit the conference link: www.issp.u-tokyo.ac.jp/public/issp-10/