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Regulars

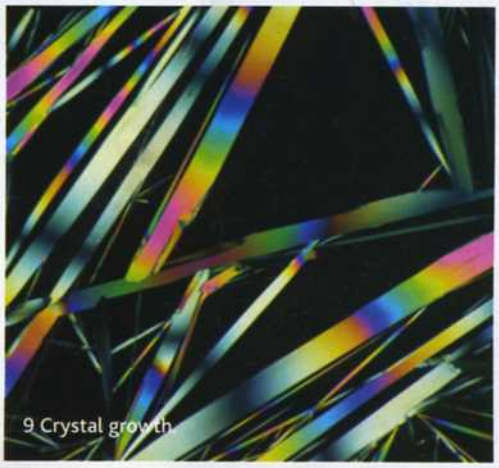
Updates

Cover Image

Collapse of a carbon nanotube micro-pillar

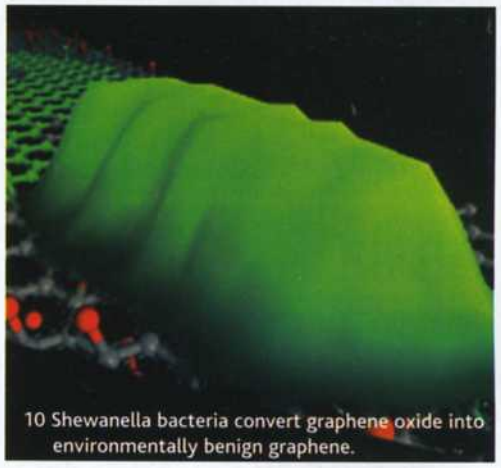
The original scanning electron microscope (SEM) image shows a top-down view of a carbon-nanotube (CNT) micro-pillar after compressive failure at ~1 GPa stress. This CNT micro-pillar was fabricated via focused ion beam micromachining of highly dense CNT brushes, which were produced by high temperature vacuum decomposition of SiC single crystals. During in-situ SEM micro-compression experiments, these dense CNT pillars are found to exhibit higher modulus and orders of magnitude higher resistance to buckling than CNT brushes produced using other methods. The ability of these dense CNTs to dissipate energy, while withstanding such elevated stresses, is highly promising for microscale energy-absorption applications.

William M. Mook and Siddhartha Pathak. EMPA – a Research Institute of the ETH Domain, (Swiss Federal Laboratories for Materials Testing and Research), Feuerwerkerstrasse 39, CH-3602 Thun, Switzerland, william.mook@empa.ch



9 Crystal growth.

10 Crystalline domains in concentrated solutions of two types of nanotubes.



10 Shewanella bacteria convert graphene oxide into environmentally benign graphene.

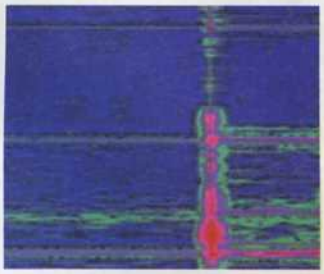
Lead story 14

Viewing spin structures with soft X-ray microscopy

The spin of the electron and its associated magnetic moment marks the basic unit for magnetic properties of matter. Magnetism, in particular ferromagnetism and antiferromagnetism, is described by a collective order of these spins, where the interaction between individual spins reflects a competition between exchange, anisotropy and dipolar energy terms.

Peter Fischer

Microscopy under the microscope

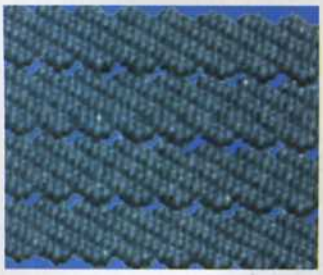


Review 24

Bistability, higher harmonics, and chaos in AFM

This review highlights the non-linear dynamics in the amplitude modulation mode and how they enable and affect nanoscale material characterisation.

Robert W. Stark

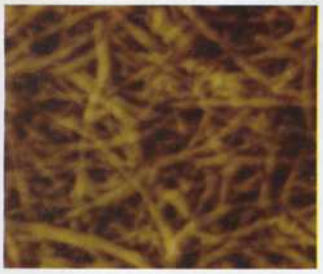


Current Research 34

Charge-transfer with graphene and nanotubes

Charge-transfer between electron–donor and –acceptor molecules is a widely studied subject of great chemical interest. The Charge-transfer phenomenon in graphene and SWNTs is examined in this article in view of its potential utility in device applications.

C. N. R. Rao and Rakesh Voggu



Current Research 42

Why does paper get stronger as it dries?

Surprisingly the strength of wet paper is still poorly understood. Here Tejado and van de Ven show that the traditional explanation of the strength of wet paper is incorrect.

Alvaro Tejado, and Theo G.M. van de Ven

Next issue

Printable solar cells

Printable polymer or hybrid solar cells (PSCs) have the potential to become the leading technology of the 21st century in conversion of sunlight to electrical energy. Because of their ease of processing from solution fast and low cost mass production of devices is possible in a roll-to-roll printing fashion.

Probing the improbable: imaging carbon atoms in alumina

The ability to probe the three-dimensional atomic structure of materials is an essential tool for material design and failure analysis. Atom-probe tomography has proven very powerful to analyze the detailed structure and chemistry of metallic alloys and semiconductor structures.

Sensing current and forces with SPM

In this review, scientists from California show hybrid combinations of AFM and STM that bring together the best of two worlds: the simultaneous detection of atomic scale forces and conduction properties.

Wide-field SEM of semiconducting minerals

There has been significant progress in recent years aimed at pushing the spatial resolution limits of scanning electron microscopes. Many of these endeavors have been driven by advances in the field of nanotechnology and the need to investigate the morphological features of sub-micron size materials.