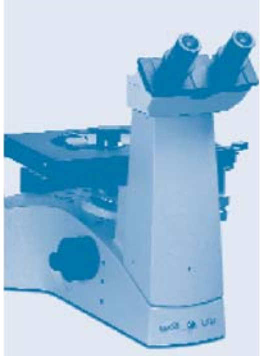


TESTING CHARACTERIZATION

Metal organic frameworks have highly porous structures

This photomicrograph shows metal organic frameworks (MOFs), or nanostructures with a cubic topology. MOFs are highly porous organic matrices with the capacity to store high-energy gases such as hydrogen and natural gas. The image is one of the "Images from the World of Research" series, showing images from BASF research. The images in this series allow the viewer to explore structures that would otherwise only be seen by analytical chemists. State-of-the-art technologies such as scanning electron microscopy and transmission electron microscopy enable this detailed view.

For more information: BASF Corp., 100 Campus Drive, Florham Park, NJ 07932; tel: 800/526-1072; www.basf.de/research_images.

NIST imaging system maps nanomechanical properties

An imaging system that quickly maps the mechanical properties of materials at scales on the order of billionths of a meter has reportedly been developed at the National Institute of Standards and Technology, Gaithersburg, Md. The new tool can be a cost-effective way to design and characterize mixed nanoscale materials such as composites or thin-film structures.

The images are based on measurements and interpretations of changes in frequency as a vibrating AFM tip scans a surface. Such measurements have commonly been made at stationary positions, but until now 2D imaging at many points across a sample has been too slow to be practical. The new system has the special feature of locking onto and tracking changes in frequency as the tip moves over a surface. Mechanical properties of a sample are deduced from calculations based on measurements of the vibrational frequencies of the AFM tip in the air, and changes in frequency when the tip contacts the material surface.

For more information: Laura Ost, National Institute of Standards and Technology, 100 Bureau Drive, Gaithersburg, MD 20899; tel: 303/497-4880; laura.ost@nist.gov; www.nist.gov.

In-situ microscope reveals why smaller is stronger

Pillars of nickel with diameters between 150 and 400 nanometers have been compressed under a flat punch made of diamond by researchers at Lawrence Berkeley National Laboratory, Berkeley, Calif., with colleagues from Hysitron Inc. and the General Motors Research and Development Center. Results were recorded by an in-situ transmission electron microscope that allows samples to be stressed, measured, and videotaped while being observed under the electron beam.

The videotaped images from the electron microscope helped the researchers understand why nanoscale nickel pillars are so strong by allowing them to observe changes in the microstructure of the pillars during deformation. Before the test, the nanoscale pillars of nickel were full of dislocations. As the pillars were compressed, all the dislocations were driven out of the material, reducing the dislocation density by 15 orders of magnitude and pro-

Nanotech research project to enable atom-scale processing

A joint nanotechnology research project to advance electron microscopes and focused ion beam systems (FIBs) so that the structure of materials can be made visible and can be processed at the single-atom scale is being undertaken by the FEI Co. and the Netherlands-based FOM foundation. The program will have a two-fold focus. The first is to advance and fully harness the potential of electron microscopes and ion beam systems for a full range of applications in physics and biology. The second is to research the interaction between electron beams, ion beams, laser light, and matter. This will result in much-needed fundamental innovations for future generations of microscopes and focused ion beam systems.

For more information: Frank de Jong, FEI Co., 5350 NE Dawson Creek Drive, Hillsboro, OR 97124; tel: 503/726-7500; www.feico.com; www.fom.nl.

BRIEFS

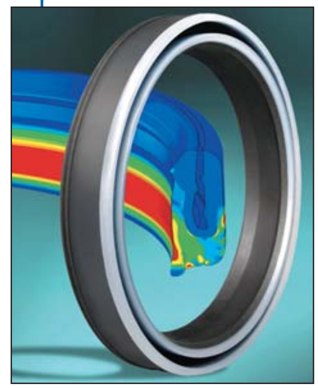
Admet Inc. is expanding and enhancing its product offerings for upgrading testing machines. The advances enable customers to equip their machines with state-of-the-art digital controllers, sophisticated materials testing software, and fast acting servo motors and servo hydraulic power units. www.admet.com

ASTM International has published *Manual 56, Guide to Friction, Wear and Erosion Testing*. Authored by Kenneth G. Budinski, it provides the details of how to conduct tribotests, how to avoid pitfalls, and which are most useful. www.astm.org

Bruker AXS GmbH has signed an agreement to acquire all of the equity of **JUWE Laborgeraete GmbH,** which makes advanced combustion analysis systems for the light elements carbon, hydrogen, nitrogen, oxygen, and sulfur. www.bruker-biosciences.com

Olympus NDT introduces the Epoch LTC digital handheld ultrasonic flaw detector for a wide range of weather conditions and difficult inspection environments. It can store 50,000 IDs with waveform and measurement parameters. www.olympusndt.com ducing a perfect crystal. The researchers call the process mechanical annealing.

For more information: Andrew Minor, Lawrence Berkeley National Laboratory, Berkeley, CA 94720; tel: 510/495-2749; aminor@lbl.gov; http://www.lbl.gov/Science-Articles/Archive/MSD-mech-annealing.html.



Design tool can help improve part design for thermoplastics

A new design tool that can help engineers predict the long-term behavior of Santoprene thermoplastic vulcanizates has been introduced by ExxonMobil Chemical, Houston. The new "compression stress relaxation database" helps predict how Santoprene TPVs perform initially and then at any time during the expected life of the part. This enables engineers to create more effective designs, improving part reliability while reducing material use and costs.

When designing a seal, an engineer must know the level of sealing required at the beginning of its life, which can be calculated via finite element analysis or determined through prototype testing. From there, this new database helps to accurately plot the long-term performance of the material at any point in the future.

For more information: ExxonMobil, 5959 Las Colinas Boulevard, Irving, TX 75039-2298; tel: 972/444-1000; www.santoprene.com/designyourpart.

Electrically conductive plastic enables radiation detector

A radiation detector made from a new type of plastic that conducts electricity has reportedly been developed by a team of researchers from the Department of Physics at the University of Surrey, England. As the radiation dose increases, more current flows in the plastic detector, allowing an accurate measurement to be made. The research effort has received a boost recently in the form of a one-year research grant from the Science and Technology Facilities Council. The grant is being shared with Centronic Ltd., a Croydon-based company that manufactures and develops radiation detectors.

For more information: Stuart Miller, University of Surrey, England; tel: 01483 689314; s.e.miller@surrey.ac.uk; www.surrey.ac.uk.

Surface wave sensor detects fatigue cracks in complex parts

A surface-wave sensor for the detection of fatigue cracks in complex-geometry aerospace structures was described in a presentation at AeroMat 2007. Titled *Surface-Wave Sensing of Cracks in Complex Geometry Aerospace Structures,* it was prepared by Samuel Kuhr and Jeong K. Na of the University of Dayton

Research Institute; James Blackshire of the U.S. Air Force Research Laboratory; and Steven A. Martin of NDE Computational Consultants. Surface-wave sensors provide an effective way of detecting cracks based on pulse-echo and pitch-catch methods, where the blocking or reflection of elastic wave energy by the crack provides a simple means of detection.

Guided elastic waves that sense and monitor structural health have been proven in recent years in several important applications. Much of this work has focused on the development of innovative global sensing methods in which elastic waves detect damage over extended ranges from tens of centimeters to meter distances.

However, in many aerospace applications, the location of the anticipated damage is deterministic and localized in nature. This is particularly true for fatigue cracks, which typically initiate and grow in joints, fasteners, and high-stress structural locations. When this is the case, a global integrated sensing method is not required, and a local, targeted sensing method is the preferred choice.

For more information: James Blackshire, Air Force Research Laboratory, Wright-Patterson Air Force Base, Dayton, OH 45433; james.blackshire@wpafb.af.mil; www.wpafb.af.mil.

Instrumented indentation tests irradiated materials

Characterization of irradiated material by instrumented indentation has been carried out in a ZHU0.2/Z2.5 modular testing system from the Zwick Roell Group, Ulm, Germany, by Forschungszentrum Karlsruhe, a research group in Germany. The studies are related to the development of technologies for a nuclear fusion reactor. The tests were carried out to investigate the material's mechanical properties after irradiation, and to understand irradiation damage mechanisms.

The instrument is installed in a gas-tight hot cell. It carries out multistage indentation tests (load/unload) with different holding times. Neural networks then evaluate the correlation between these test data and the parameters of a viscoplastic material.

The unique operation of the indentation tester allows it to carry out precision loading cycles at various forces and displacements with predetermined holding times during each cycle. TestXpert, Zwick's software platform for materials testing, controls the machine and acquires the synchronized force and indentation data. This data is then stored in a special format and transmitted to the neural network system to determine properties such as Young's modulus, yield, and ultimate tensile strength, as well as hardening coefficients.

For more information: Zwick Roell AG, Ulm, Germany; tel: 49 7305-10-0; fax: 49 7305-10-200; www.zwick.com.