Selections

Bodelin Technologies, Lake Oswego, Ore., introduced ProScope Micro Mobile, a professional microscope that attaches to mobile devices like tablets and smartphones. The device uses precision optical glass for edge-to-edge imaging and magnification from 20-80 ×. Twelve white LEDs, arrayed in two alternating circles to allow for polarized and reflective lighting, can adjust intensity with a 3-way power save switch. An onboard lithium ion battery provides five hours of continuous use and a USB charging cable comes with the kit. www.bodelin.com/proscope.

Selima Partners LLC, Tampa, Fla., acquired the component test business unit from Tektronix Component Solutions, Orlando, Fla. The new entity, Precision Test Solutions, will expand its services in testing and validating a broad range of devices to ensure they meet military, space, and commercial aerospace requirements. Services will support defense contractors, semiconductor OEMs, and suppliers to aerospace manufacturing lines. www.precisiotestolutions.com.

NSL Analytical Services Inc., Cleveland, dedicated its newly renovated metallurgical testing facility with an open house celebration in May. The 11,800-sq-ft lab houses the company’s mechanical testing, metallography, and R&D departments. NSL invested more than $1.6 million to purchase and make major renovations to convert an existing building into a laboratory with extensive testing and machining capabilities. NSL is certified as an ISO/IEC 17025 laboratory, Nadcap certified Materials Testing Laboratory, and 10 CFR 50 Appendix B (Nuclear) laboratory. www.nslanalytical.com.

Testing Characterization

Technique measures chemical properties of polymer nanostructures

Researchers at the University of Illinois at Urbana-Champaign measured the chemical properties of polymer nanostructures as small as 15 nm, using a new technique called atomic force microscope infrared spectroscopy (AFM-IR). AFM-IR measures infrared absorption at the nanometer scale, providing information about chemical bonding in a material sample. Absorption properties can also be used to identify the material. Researchers analyzed AFM-IR dynamics using a wavelet transform, which organizes the AFM-IR signals that vary in both time and frequency. By separating the time and frequency components, researchers improved the signal-to-noise ratio to thereby measure significantly smaller samples than previously possible. www.illinois.edu.

Fatigue model leads to more durable ships

At the Aalto University School of Engineering, Finland, professor Heikki Remes developed a model to determine how fatigue sets in with various welded steel materials. The model aims to boost development of lighter structures and more energy-efficient ships. Today’s fatigue measurements used by classification societies are based on the average quality of the weld, with the same design guidelines used for both traditional and more advanced structures. However, due to improvements in manufacturing, it is possible to achieve welded joints that are significantly above average. Using the new model, the difference between traditional and advanced structural joints and the impact on fatigue resistance can be considered.

The study can be used to establish models for fatigue endurance of various welded steel structures. The work is linked with a project of the Academy of Finland on fatigue in thin sandwich panel structures and with the BESST EU project to promote European shipbuilding competitiveness. Also under preparation are national development projects within the Finnish Metals and Engineering Competence Cluster. For more information: Heikki Remes, heikki.remes@aalto.fi, www.aalto.fi.

Hydrogen compatibility reference debuts on OpenEI

A detailed Technical Reference on Hydrogen Compatibility of Materials from Sandia National Laboratories, Livermore, Calif., is now available on the Energy Dataset of OpenEnergyInfo. Many who work to increase the competitiveness of hydrogen-powered fuel cell electric vehicles (FCEVs) already consult the guide, which has been hosted on Sandia’s website for several years. Now, the information is more widely available and easier to access. The reference focuses on compatibility issues between hydrogen and other materials.

The guide provides detailed information on the effects of hydrogen on materials that might be used to store hydrogen and deliver it to FCEVs. Developed and updated by Sandia researchers, the reference consolidates results from an extensive review of reports and journal publications, as well as new Sandia research, on a range of compatibility issues that must be addressed to increase use of hydrogen vehicles and their infrastructure. Concentrating on relatively low-cost and high-strength materials, including a variety of steel, aluminum, copper, and nickel alloys, as well as non-metal polymers, the report provides data on potential high-priority impacts of hydrogen on material properties such as yield and tensile strengths, fracture toughness, and fatigue crack growth rates. http://en.openei.org.

X-rays capture fuel cells in action

Solid oxide fuel cells (SOFCs) hold promise for efficiently converting a wide range of fuels into electricity. But these solid-state devices are made of complex materials that require spe-
pecific conditions for optimal operation, including high temperatures, variable pressures, and electrical polarization. Some of those conditions cause fuel-cell components to deteriorate, and studies of individual component materials and conditions in isolation do not accurately reflect what happens to fuel cells in operation. Studying solid-state fuel cells in use is a further challenge because the action takes place inside a high-temperature furnace.

To "see inside the box," Samson Lai, a graduate research assistant at the Georgia Institute of Technology, Atlanta, and his team needed x-ray vision—the kind made possible by high-intensity x-ray beams at the National Synchrotron Light Source (NSLS) at the U.S. Dept. of Energy’s Brookhaven National Laboratory, Upton, N.Y.

The team designed a custom furnace to enable control over temperature, gas contamination, and electrical polarization and placed it in the line of x-rays at NSLS beamline X18B. The device has two windows, one to allow x-rays to enter and interact with fuel cell components operating and another for fluorescent x-rays resulting from those interactions to carry data to a detector outside the box. Scientists call the technique "operando spectroscopy," spectroscopic analysis of the active material performed while the device is operating. Data show that carbon dioxide and water vapor have different oxidation and reduction effects on different elements in the SOFC electrode, and those effects differ at high versus low temperatures. The goal is to gain insight into how gas contaminants cause degradation, which could lead to new materials development. www.bnl.gov.

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Schematic of the furnace designed to test solid-state fuel cell components in action at beamline X18B at the National Synchrotron Light Source.