

PROCESS TECHNOLOGY



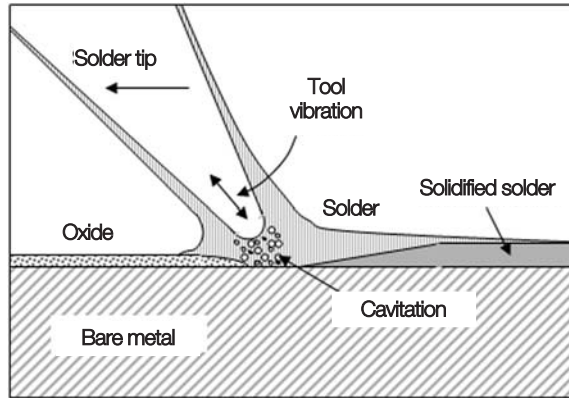
Ultrasonic soldering method removes oxide without flux

An ultrasonic soldering technology in which high-frequency vibrations remove oxides has reportedly been developed at the Edison Welding Institute, Columbus, Ohio. Ultrasonic soldering is a flux-less joining process that consists of introducing high-frequency vibrations through a solder tool into the molten solder and inducing a cavitation action at the tool tip, as shown in the diagram.

Upon near-contact of the tool tip with the base material, the cavitation forces disrupt and disperse surface oxides, thereby enabling solder wetting to the base metal. Thus, the oxide layer of the bonding surface is disrupted and removed by cavitation and not by any fluxing agent.

Elimination of flux, which is the key advantage of the ultrasonic soldering process, leads to many associated benefits. These include elimination of hazardous exposure and corrosion caused by flux entrapment, and improved wetting inside sharp corners and small crevices.

For more information: Shankar Srinivasan, Edison Welding Institute, 1250 Arthur E. Adams Drive, Columbus, OH 43221-3585; tel: 614/688-5059; shankar_srinivasan@ewi.org; www.ewi.org/Insights/summer08/medical_electronics.html.



Weapons-grade plutonium to be converted to nuclear fuel

Three and a half metric tons of weapons-grade plutonium are to be converted annually into mixed oxide nuclear reactor fuel assemblies in a specialized furnace sintering system in a joint venture by the Engineering Systems Division of AMG Advanced Metallurgical Group N.V., the Netherlands. Shaw Areva MOX Services LLC awarded the contract for detailed engineering of sintering furnace systems for the production of mixed oxide nuclear fuels.

AMG's Engineering Systems Division's 50% owned nuclear joint venture, Furnaces Nuclear

Applications Grenoble S.A., designs and produces sintering systems for a number of nuclear applications. This contract with Shaw is for the detailed engineering of two sintering furnaces for the Shaw Fuel Fabrication Facility at the Savannah River Site in Aiken, South Carolina.

The second phase of the contract, expected to be awarded within twelve months, will involve the production, testing, and delivery of the sintering systems. These vacuum-type sintering systems will be used in the production of mixed oxide (MOX) uranium and plutonium nuclear fuel for light water reactors.

For more information: Shaw Areva MOX Services LLC, P.O. Box 7097, Aiken, SC 29804; www.amg-nv.com; www.dcsnox.com.

NADCA offers die casting design assistance on web site

A web site that offers the information needed to develop and manufacture die casting designs is available at a web site by the North American Diecasting Association, Wheeling, Ill. The site is divided into easy to use multimedia modules that cover product development, part design, die casting alloys, die casting processes, product examples, and even instant support.

Developing a product for die casting is similar to any other manufacturing process. However, the die casting process offers distinct product advantages and cost reductions that require a different approach to product development. This die casting product development approach should be applied to new products and when an existing product is being converted from another manufacturing process.

For more information: North American Die Casting Association, Wheeling, IL 60090-5809; tel: 847/279-0001; www.diecastingdesign.org.

BRIEFS

American Galvanizers Association

has improved its website, which features increased functionality, with tweaks and additions to the "Members Only" section and new online services. The project database has an improved search function featuring more searchable criteria and thumbnails of project results.

www.galvanizeit.org

Dymax 3000 series

plastic-bonding adhesives cure in seconds upon exposure to ultraviolet light and/or visible light, even through UV-blocked plastics.

www.dymax.com

Ferro Corp.

has purchased a grinding and fabrication fluids business for brittle materials from Fluid Logic LLC, of Portland, Oregon.

www.ferro.com

Hitco

is midway through a three-year, \$50 million investment program at its California facilities. It recently purchased a Viper 6000 fiber placement system, two automated tape lay-up machines, and an automated Bertsche P5 milling machine.

www.hitco.com

MetalTek International, Waukesha, Wis., has acquired **Meighs Castings Ltd.** from **Langley Alloys**, Stoke-on-Trent, England. Meighs Castings produces components of aluminum bronzes, super austenitic and duplex stainless steels, nickel-base alloys, and other corrosion-resistant materials. www.metaltex.com

NADCA has released a completely revised version of *High Integrity Die Castings*. The book was written by Diran Apelian, Worcester Polytechnic Institute, and John L. Jorstad, JJ Technologies Inc., with contributions from many others. www.diecasting.org

Nucor Corp. plans to install a plate heat-treating facility at its mill in Hertford County, North Carolina, which will have an estimated annual capacity of 120,000 tons and the ability to heat treat plate from 3/16 of an inch through 2 inches thick. www.nucor.com

Phoenix Scientific Industries Ltd., U.K., has received about \$1.92 million to develop a commercial production process for spherical, low-oxygen, ceramic-free titanium powder at a fraction of current costs. The grant provides matching funding for a three-year, \$3.85 million project with the **University of Greenwich** and **Cambridge Quality Technology Ltd.** www.psi.com

Vibration technique molds stronger plastic products

A simple, software-directed device that vibrates molten plastic in an injection mold to produce stronger products from recycled plastic has reportedly been developed at Lehigh University, Bethlehem, Pa. Only a small amount of recycled plastic is used in this process, says Prof. John Coulter, because recycled plastic is poor in quality and would reduce the product's strength. However, the vibration-assisted process enables manufacturers to recycle plastic and still produce strong products.

Plastics are strengthened through vibration because the motion changes their molecular orientation. Molecules in non-vibrated plastics may stick to the wall of the mold or become folded over. However, vibration jiggles the molecules, mixing them more uniformly and allowing them to stretch out to take advantage of their entire length.

Prof. Coulter and his Lehigh colleagues have found that by vibrating the feed screw that delivers the liquefied plastic into the mold, they can achieve the same results without the need to vibrate the mold itself. Making simple alterations to the screw's hydraulic system, they designed software that directs the device to vibrate at low frequencies after the plastic has been fed into the mold.

For more information: John Coulter, Lehigh University, Bethlehem, PA 18015; tel: 610/758-4503; jc0i@lehigh.edu; www.lehigh.edu.

Spirit AeroSystems Inc has signed a contract with Airbus to design and produce the wing leading edge structure of the new A350 XWB (Xtra Wide-Body) aircraft. Spirit will design and assemble the 32 meter long structure, which will be about 50% carbon fiber composite content, primarily at its European facility in Prestwick, Scotland. The composite front spar will be built at its new facility in Kinston, North Carolina, on which construction will start later this year. Composite sub-assemblies will be manufactured at the Spirit Malaysia facility at Subang, near Kuala Lumpur. Spirit has already announced that it will design and build the A350 XWB's composite center fuselage section in the North Carolina factory. The A350 XWB passenger aircraft is expected to be over 50% reinforced plastic. www.spiritaero.com

Stiffener forming machine lowers cost, raises quality

A stiffener forming machine that provides automation technology for the manufacture of composite stiffeners has been announced by Alliant Techsystems, Minneapolis, Minn. A technology built for the construction of next-generation commercial aircraft, the machine reportedly provides lower-cost, higher-quality stiffeners, with superior compaction and repeatability compared to those produced by the standard hand lay-up process.

Providing a linear and radial option, the machine can fabricate stringers and the frames that make up the skeleton of a commercial aircraft fuselage shell at production rates nearly ten times faster than that of the traditional lay-up process. ATK currently has ten large-format fiber placement machines in place, and plans to install two more in the next 18 months. www.atk.com

Molten salts break down cellulose with no toxic chemicals

A bioprocess in which molten salts help break down tough, energy-containing cellulose molecules without creating unwanted by-products, has reportedly been developed by researchers at Lawrence Berkeley National Laboratory in California.

Existing techniques use strong acids or high temperatures to start degrading cellulose into simple sugars, but these methods also produce toxic chemical by-products. For reasons that aren't well understood, those unwanted chemicals inhibit the microbes that ferment the sugars into fuels, thus reducing yields.

Also called ionic liquids, molten salts consist almost entirely of ions. The electrostatic forces exerted by these charged particles make the liquids exceptionally good for dissolving a wide range of substances. The liquid "completely disrupts the crystalline structure of the cellulose," says LBL's Blake Simmons. The resulting amorphous structure is much easier to break down into glucose.

For more information: Blake A. Simmons, Lawrence Berkeley National Lab, Berkeley, CA 94720; tel: 510/486-7808; BASimmons@lbl.gov; www.lbl.gov.

Ceramic coating helps composites function at high temperatures

A ceramic thermal barrier technology that enables the use of composites in environments with temperatures above their melting point has been developed by Zircotec, Oxfordshire, England. In tests for a typical application, the composite surface temperature was reduced by more than 125°C.

The coating can be engineered to suit specific customer requirements, adjusting the coating properties both through the thickness and across the surface so the component can cope with hot spots. The coating can also be customized for different forms of heat transfer such as radiant, conductive, or convective heating.

"We can apply a reflective surface layer to help protect against radiant heat, or we can increase the thickness of the ceramic in areas where a hot spot can occur," says Zircotec's Peter Whyman. "We also have the ability to build in a conductive sub-layer that will help to dissipate heat away from any hot spots, and can also help deal with transient heating solutions. This means we apply just the right amount of coating to deliver the necessary protection while minimizing the weight impact of the coating, as low as 0.03 g/cm² for some applications."

For more information: Peter Whyman, Zircotec, Harwell Science and Innovation Campus, Oxfordshire; England OX11 0QJ; tel: 44 (0)1235 434326; fax: 44 (0)1235 434329; www.zircotec.org.uk



Longer-lasting batteries designed for hybrid vehicles

Safer, less expensive, more powerful, and longer-lasting lithium-ion batteries for hybrid-electric vehicles are under development by A123Systems, Watertown, Mass., and the U.S. Department of Energy's National Renewable Energy Laboratory. The laboratory and the battery-maker have signed a three-year, Cooperative Research and Development Agreement to examine and develop new techniques to improve thermal management in advanced transportation batteries.

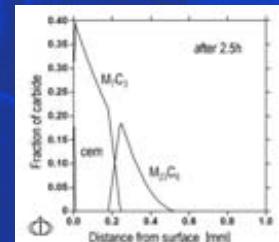
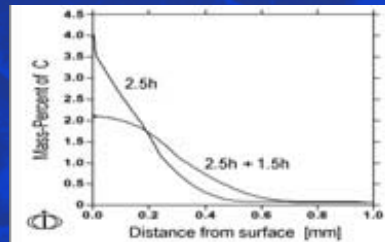
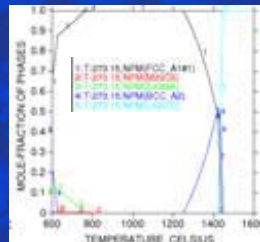
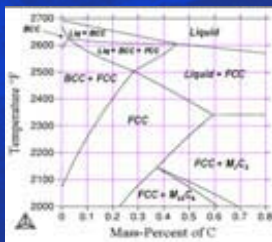
By better understanding the thermal behavior of lithium-ion batteries, NREL researchers will help A123Systems engineers develop improved thermal management systems, optimize the design of the battery cell, and build a battery pack that's lighter, cheaper, and more durable. The company is developing high-power lithium-ion batteries with nanophosphate cathodes under a contract with the U.S. Automotive Battery Consortium and the FreedomCAR-Fuel Partnership.

For more information: Bart Riley, A123Systems, 321 Arsenal Street, Watertown, MA 02472; tel: 617/778-5700; www.a123systems.com; www.nrel.gov.



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