

PROCESS TECHNOLOGY

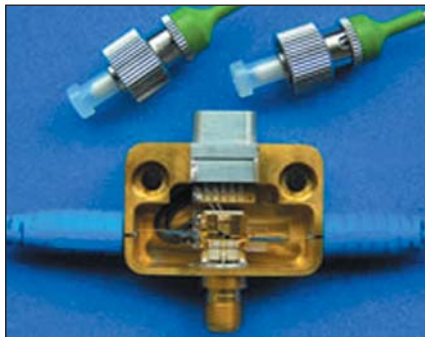
Sandwich technique enables 3D optical chip fabrication

A wafer bonding technique in which separate slices of electronic and optical material are bonded to make complex three-dimensional integrated circuits involving both optical and electronic elements has reportedly been developed in a European Union research consortium coordinated by the Fraunhofer Institute for Telecommunications in Germany.

To show the potential of wafer bonding, the project partners set out to build optical elements known as "active microring resonators." Microrings, which act as power storage devices, allow high-bandwidth communications signals to be spread across a wide range of laser frequencies. They also have great potential as wavelength converters for telecommunications, and in monitoring applications such as the detection of biological or chemical substances.

Wafer substrates made of InP and GaAs were fabricated into various kinds of microrings with radii down to 10 μm . The two-layer technique enabled microrings with vertical connections to the transparent waveguides that carry light in and out of the microrings. Compared to the standard technique of horizontal coupling on a single layer, vertical coupling allows the production of smaller microrings, which in turn means higher data transmission speeds.

For further information: Christian Nielsen, Fraunhofer Institute, Germany; tel.: 32 2 639 0277; Christian.Nielsen@esn.eu; www.fraunhofer.de.



Nanodispersions in water-base coatings help prevent scratches

Nanoengineered dispersions have been optimized for water-base coatings to increase their scratch resistance and gloss retention to be equal to those of oil-based organic systems, reports Nanophase Technologies Corp., Romeoville, Ill. Nanoengineered dispersions enable an applied coating to resist scratching and marring and retain high gloss by up to 80% after rigorous industry testing. The new nanoengineered dispersions produce a three to four times improvement in scratch resistance for the commercially available water-based coatings tested. The nanoengineered products are available in highly stable dispersion formats containing 30% to 50% by weight nanoparticles. The additives are said to provide performance improvements at nanoparticle loading levels as low as 0.5 wt%.

For more information: Kevin Wenta, Nanophase Technologies Corp., 1319 Marquette Drive, Romeoville, IL 60446; tel: 630/771-6743; kwenta@nanophase.com; www.nanophase.com.

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AWS publishes new bridge welding code

The American Welding Society (AWS) announces its newly published bridge welding standard, *AASHTO/AWS D1.5M/D1.5:2008*, with the *AASHTO (American Association of State Highway and Transportation Officials) Standard Specifi-*

Laser treatment toughens dental grade ceramics

A high-speed periodic-pulse laser treatment of dental grade ceramics alters the surface structure, creating nanocrystalline material with up to 50% higher flexure strength, report researchers at Oak Ridge National Laboratory, Oak Ridge, Tenn.

Currently, cracks begin at the interface between ceramic and remaining tooth or metallic anchor, and grow to create a fatal crack and failure of the tooth.

The proprietary technique controls the shape and the microstructure, while adding only pennies to a product worth hundreds of dollars. The treated composite resembles biological materials with complex hierarchical structure.

The technology is being developed by Claus Daniel of ORNL, and partners at University of Illinois at Chicago, Boston University, and the University of Tennessee.

For more information: Claus Daniel, Oak Ridge National Laboratory, Oak Ridge, TN 37831; tel: 865/241-9521; danielc@ornl.gov; www.ornl.gov.



BRIEFS

Alcoa announces that a team from its **Alcoa Auto and Truck Structures** business in Hungary delivered specially made new lightweight aluminum truck bodies in three months that were made from aluminum extrusions, castings, and plate from **Alcoa Kofem**.
www.alcoa.com

American Society of Mechanical Engineers has announced the ASME Digital Library, which consolidates 22 technical journals and more than 100 conference proceedings into a single online resource. ASME Press e-Books also are available in the Digital Library.
www.asme.org

The **American Welding Society** announces publication of the *Brazing Handbook 5th Edition*. This updated and expanded version provides a comprehensive, organized survey of the basics of brazing processes and applications.
www.aws.org

Ceradyne Inc. announces that its ceramics operation, **ESK Ceramics** in Kempten, Germany, has received a five-year contract for its *ESKasic* silicon carbide industrial pump seal faces for an estimated minimum amount of \$50 million.
www.ceradyne.com

Innoval Technology, a light metals consultancy based in Banbury, U.K., announces that its Aluminum Rolling Technology Course has been granted Professional Development status by The **Institute of Materials, Minerals and Mining** Education and Accreditation Manager. www.innovaltec.com

Latrobe Specialty Steel Co. announces a major expansion of its vacuum remelting facility for high-alloy specialty steels based in Latrobe, Pa., with commercial production by year end. The Sandycreek plant for finishing operations in Venango County will also receive new investment, expand its building, and create new positions. www.latrobesteel.com

Nucor Corp. announces that the world's first commercial strip casting facility for plain-carbon steel sheet, utilizing the Castrip Process, has set a new record for sequence casting. The facility cast 24 ladles of steel, continuously, over a 38-hour period in late December. Total throughput for the record was 2467 tons cast, while producing 2387 tons of prime coils. www.nucor.com

Schott Solar will construct a new solar energy technology production facility in the Mesa del Sol region of Albuquerque, N.M., to manufacture receivers for concentrated solar thermal power plants and photovoltaic modules. www.schott.com

tion for Highway Bridges or AASHTO LRFD Bridge Design Specifications. This code covers the best practices and general provisions of routine bridge welding applications.

This 2008 edition of the code represents the culmination of many years of cooperative work by the Joint AWS/AASHTO Committee on Bridge Welding. This joint code was developed in response to industry demand for a single document that could provide management, engineers, foremen, and welders with cost-effective bridge fabrication approaches, while at the same time addressing the issues of structural integrity and public safety.

For more information: Adrienne Zalkind, American Welding Society, Miami, FL 33126; tel: 800/443-9353, ext. 416; azalkind@aws.org; www.awspubs.com; www.aws.org.

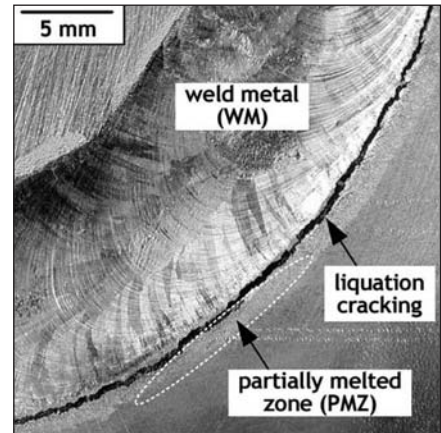
Method developed to prevent liquation cracking in Al welds

A method to predict and eliminate liquation cracking around aluminum welds has reportedly been developed by researchers at the University of Wisconsin, Madison. Called liquation cracking, these cracks can appear small but propagate over time and cause the welded area to separate from the base metal. The image shows liquation cracking in an Al-6.3Cu alloy.

Aluminum alloy plates typically are welded with a filler metal. As the liquid metal within the weld cools and solidifies, it contracts, pulling on the softened base metal around it, called the partially melted zone, or PMZ. Based on this knowledge, the researchers developed a simple criterion for determining cracking susceptibility: If the weld metal solidifies earlier than the PMZ, it will pull apart the grains in the PMZ, causing cracks.

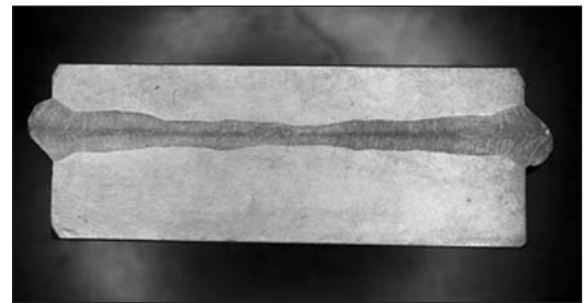
Utilizing commercial solidification software (developed by Prof. Austin Chang), Prof. Sindo Kou compares the solidification rates of the weld metal and the PMZ, then determines if there is a point at which the weld metal will be more solid than the PMZ. If so, the weld is likely to crack.

For more information: Prof. Sindo Kou, University of Wisconsin – Madison, 1509 University Avenue, Madison, WI 53706; tel: 608/262-0576; kou@engr.wisc.edu; www.wisc.edu.



Thick plates welded with 20 kilowatt fiber laser

One-inch thick 304 stainless steel plate was laser-welded at a speed of 0.85 meters/minute, and ¾-inch samples at a speed of two meters/minute with a 20 kW continuous wave 1070 nm commercial fiber laser, reports IPG Photonics Corp., Oxford, Mass. The 200-micron fiber cable has a 420-micron focus spot size. In other experiments, IPG also was able to produce high-quality welds on two-inch 304 stainless steel samples by applying laser beams from both sides with a total penetration depth of 54 to 56 mm per pass.



“The new results confirm that IPG’s 20 kW laser can have a major impact on applications requiring deep penetration welds that previously could only be obtained with very expensive electron beam welding machines requiring a full or partial vacuum,” says VP William H. Shiner.

For more information: Bill Shiner, IPG Photonics Corp., Oxford, MA 01540; tel: 508/373-1144; www.ipgphotonics.com.

Spherical cast tungsten carbide applied as hardfacing to parts

A unique machine that deposits anti-abrasion material onto industrial parts has been developed by Technogenia, Houston, Texas. Lasercarb is a laser cladding process that utilizes a

laser power source to apply Technogenia's Spherotene powder. The coating is composed of variable sizes of spherical tungsten carbide particles held in place by a nickel-base matrix. The powder is injected through a coaxial nozzle into the laser beam. The combination of the laser power and the digital control generates a highly controlled deposit. This technology coupled with an advanced CAD/CAM system allows a precise coating on the most complex geometry.

The machine includes a 4 kW high-power diode laser coupled with custom designed five-coordinate axis NC machine. It can handle parts up to 40 feet long and weighing as much as 5000 pounds.

Some applications include protecting rotors, scrapers, shaft bearings, stabilizers, sleeves, and nonmagnetic stainless steel components. The spherical tungsten carbide particles produced by Technogenia exhibit a hardness of 3000 +/- 500 Hv. The spherical shape produces a high-density deposit, reducing stress and cracking.

For more information: Jean-Bertrand Crepin, Technogenia, 708 Old Montgomery Rd., Conroe, TX 77301; tel: 936/441-4770; jbcrcpin@technogenia.com; www.technogenia.com.

Multi-ply plating process makes steel-core coins

RCM Multi-Ply Plating is a unique electroplating process in which thin, alternating layers of nickel and copper are deposited over a steel blank to produce the best quality, most economical nickel- and copper-base coins, says the Royal Canadian Mint, Ottawa, Canada. The technology has many advantages for coins and for blanks supplied to coin manufacturers. Multi-ply plating requires less nickel, copper, or bronze than other minting techniques, and is significantly faster than single-ply plating. In addition, nickel plate resists tarnishing better than cupronickel and ferritic stainless steel. Varying the thickness of each copper and nickel layer to custom specifications gives multi-ply plated coins a unique electromagnetic signature, which ensures security and prevents vending machine fraud.

For more information: Alex Reeves, Royal Canadian Mint, Ottawa, Canada; tel: 613/949-5777; reeves@mint.ca; www.mint.ca.

ThyssenKrupp Steel AG has started up its new blast furnace 8 in Duisburg, Germany. The new unit is part of a \$500 million program to secure hot metal production for the company's German plants. Around \$120 million, almost a third of the total investment, was spent on pollution-control equipment. www.thyssenkrupp.com



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