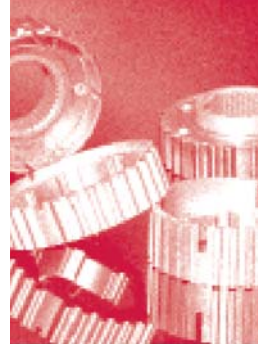


# METALS POLYMERS CERAMICS



## Cast aluminum oil tank wins Casting of the Year

Cast in A356-T6 aluminum via semi-permanent mold, this Harley Davidson oil tank (9.25 lb., 14 x 10 x 8 in.) cast by Carley Foundry, Blaine, Minn., won the 2008 American Foundry Society Casting of the Year Award. The tank was originally planned to be plastic, and a multi-piece fabrication was also considered, but the aluminum casting was shown to be more cost-effective. By casting in oil circulation tubes, the metalcaster helped make the oil reservoir more efficient and reduced the number of components in the assembly.

For more information: Carley Foundry Inc., 8301 Coral Sea Street NE, Blaine, MN 55449; tel: 763/780-5123; [www.carleyfoundry.com](http://www.carleyfoundry.com); [www.afsinc.org](http://www.afsinc.org).



## High-hard armor steel defends against armor piercing rounds

A high-hard armor steel that protects against armor-piercing rounds while also offering good blast-resistance has been introduced by Allegheny Technologies Inc., Pittsburgh, Pa. ATI 500-MIL advantages include markedly improved flatness over other high-hard steel products, better hardness consistency, minimal distortion when cut, the ability to use hot or cold forming processes, and the capability to introduce bends in the material without weldments. In addition, the specialty steel is auto-tempered, meaning it does not require the normal quench and temper treatment.

ATI 500-MIL steel is available in plate form, with sheet product currently in development. It can be installed on new vehicles and systems as well as retrofitted on legacy systems. The specialty armor plate is offered in thickness gauges from 3/16 inch to 1 inch (0.5 to 2.5 cm), and in sizes as large as 96 x 300 inches (243 x 763 cm), with customized manufacturing solutions available to meet specific needs.

The armor is designed to meet the new U.S. MIL-DTL-46100E high-hard specifications for ballistic performance and is being qualified for NATO and other international standards. Applications range from medium- and heavy-weight tactical vehicles to armored patrol cars, above-deck structures on ships, and aboard aircraft in perforated versions.

For more information: Dan Greenfield, Allegheny Technologies Inc., 1000 Six PPG Place, Pittsburgh, PA 15222-5479; tel: 412/394-3004; [www.alleghenytechnologies.com](http://www.alleghenytechnologies.com).

## Gallium-indium compound cools photovoltaic solar cells

A ten-micron-thick layer of a gallium-indium compound placed between a photovoltaic cell and a copper heat sink allows increasing the concentration of light on photovoltaic cells by a factor of ten without causing them to melt, say researchers at the IBM T.J. Watson Research Center, Yorktown Heights, N.Y. The principle behind concentrated photovoltaic cells is to focus light onto a relatively small area of photovoltaic semiconductor material with a large lens. The benefit is that only a fraction of the semiconductor material is needed, thereby reducing costs.

However, this raises the temperature of the chip.

Applying this thin layer of molten alloy has enabled IBM researchers to focus the equivalent of 2300 times the sun's natural energy onto a one-centimeter-square photovoltaic chip.

Without cooling, the photovoltaic cell temperature would be in excess of 1500°C (2730°F), and therefore would simply vaporize. With the liquid metal and water-cooled copper system, the IBM photovoltaic material remains at 85°C (185°F).

If additional challenges to move this project from the lab to the fab can be overcome, a much smaller number of photovoltaic cells concentrating more light onto each cell would enable a significant cost advantage.

For more information: Supratik Guha, IBM T.J. Watson Research Center, Yorktown Heights, NY 10598; tel: 914/945-3835; [guha@us.ibm.com](mailto:guha@us.ibm.com); [www.watson.ibm.com](http://www.watson.ibm.com).

## BRIEFS

**ASTM Committees B05 on Copper and Copper Alloys and B01 on Electrical Conductors** is to sponsor a *Workshop on Copper and Aluminum Wire and Cable Connections Capability Study*, Oct. 1, 2008. [www.astm.org](http://www.astm.org)

**The American Foundry Society** has sponsored a documentary, *Spotlight On Metalcasting* on PBS television. It is also available for public viewing at [www.youtube.com](http://www.youtube.com). The documentary shows the metalcasting process and the positive ways metal castings affect society. [www.afsinc.org](http://www.afsinc.org)

**The American Iron and Steel Institute** has released its *2007 Annual Statistical Report*. The 126-page book provides statistical data for the United States steel industry plus a variety of selected statistical data on the Canadian, Mexican, and world steel industries. To purchase online (\$400 for a hard copy or \$350 for an electronic version) visit [www.steelfacts.org](http://www.steelfacts.org).

**Ceram**, England, has produced gas-atomized nickel aluminide powder for improved nickel-based catalysts that could replace platinum in hydrogenation reactions and in the production of lower-cost fuel cells as part of the EU-funded project called Intermetallic Materials Processing in Relation to Earth and Space Solidification (IMPRESS). [www.ceram.com](http://www.ceram.com)

**The Dow Chemical Co.** has started up a new phenolic glycol ethers production plant in Freeport, Texas. The new plant will serve the growing demand for several grades of propylene glycol solvents. [www.dow.com](http://www.dow.com)

**Hitco Carbon Composites Inc.** has signed a long term agreement with **Alenia Aeronautica S.p.A.**, to supply the trailing edge components for the Boeing 787 horizontal stabilizer. **Boeing Commercial Airplanes** contracted Alenia as a Tier 1 supplier to build the aft fuselage and other sections of the Dreamliner. [www.hitco.com](http://www.hitco.com)

**Nucor Corp.** announces that its wholly owned subsidiary, **Harris Steel Inc.**, has signed a purchase agreement to acquire **Ambassador Steel Corp.**, Auburn, Indiana, for a cash purchase price of approximately \$185,000,000. The transaction will also include the shares of Ambassador's affiliate, **Delta Erecting Inc.** [www.nucor.com](http://www.nucor.com)

**Sikorsky Aircraft Corp.** announces an agreement with the **U.S. Army Aviation Applied Technology Directorate** to develop a new, integrated solution for enhanced helicopter rotor durability and capability. Sikorsky will research and provide a solution that increases rotor blade life in erosive environments. [www.sikorsky.com](http://www.sikorsky.com)

**SSAB Svenskt Stal AB** announces that its six production sites in North America will now operate under the corporate name SSAB. The name change from IPSCO to SSAB affects facilities in Mobile, Alabama, and Montpelier, Iowa, as well as the cut-to-length lines in Houston, Texas, St. Paul, Minnesota, and Toronto, Ontario. The headquarters for **SSAB North American Division** will remain in Lisle, Illinois. [www.ssab.com](http://www.ssab.com)

## Alloys for coal-fired power to be modeled in collaboration

The extremely high steam temperatures in the boiler and turbine of high-temperature coal-fired power plants require new materials, says ThyssenKrupp VDM, Germany. To speed up approval processes for these materials, ThyssenKrupp VDM and RWE Power, the power plant subsidiary of the RWE group, have signed a cooperation agreement and have commissioned the Fraunhofer Institute for Mechanics of Materials in Freiburg to carry out a research project.

In laboratory experiments, high-quality materials are characterized for new material models to allow the behavior of highly stressed parts to be predicted by simulation. "We are developing simulation methods for critical power plant components based on expertise we developed for the automotive industry," says Prof. Hermann Riedel, head of materials-based process and part simulation at the Fraunhofer Institute.

All the partners are contributing their specialist knowledge to the project: ThyssenKrupp VDM is providing its expertise in the production and processing of materials, the Fraunhofer Institute is carrying out laboratory tests for material characterization and developing the material models, and RWE Power is analyzing designs for power plant components and optimized use of materials.

For more information: Erik Walner, ThyssenKrupp Stainless AG, Germany; tel: 49 203 52-45130; fax: 49 203 52-45132; [erik.walner@thyssenkrupp.com](mailto:erik.walner@thyssenkrupp.com); [www.thyssenkrupp.com](http://www.thyssenkrupp.com).

## Titanium powder technology could cut part cost by 50%

A titanium powder consolidation technique could reduce the amount of energy required and the cost to make titanium parts from powders by up to 50%, say researchers at Oak Ridge National Laboratory, Oak Ridge, Tenn.

"We recently exhibited the new low-cost titanium alloy door made by ORNL for the Joint Light Tactical Vehicle, which is a next-generation combat vehicle," says ORNL's Bill Peter. "By using a titanium alloy for the door, BAE Systems was able to reduce the weight of its vehicle, yet at the same time decrease the threat of armor-piercing rounds."

New low-cost titanium powders are enabling ORNL, International Titanium Powders, Ametek, and BAE Systems to develop these technologies for titanium powder consolidation. Instead of conventional melt processing, the method allows the powders to remain in their solid form during consolidation. It saves energy, reduces the amount of scrap, and enables design of new alloys and engineered composites.

For more information: William H. Peter, Oak Ridge National Laboratory, Oak Ridge, TN 37831; tel: 865/241-8113; [peterwh@ornl.gov](mailto:peterwh@ornl.gov); [www.ornl.gov](http://www.ornl.gov).

## Iron-nickel-chromium alloy resists stress corrosion

A nickel-base precipitation-strengthened alloy that provides 860 MPa (125 ksi) minimum yield strength and an excellent combination of ductility and impact strength has reportedly been developed by Special Metals Corp., Huntington, W. Va. Called Incoloy 945, it is an age hardenable nickel-iron-chromium alloy with additions of molybdenum, copper, niobium, titanium, and aluminum.

The nickel content is sufficient to provide protection against chloride-ion stress corrosion cracking. The nickel, in conjunction with the molybdenum and copper, also gives outstanding general corrosion resistance to reducing chemicals.

Testing in various NACE environments (namely level V and VI) has shown that the alloy has excellent resistance to stress corrosion and sulfide stress corrosion. Alloy 945 is especially suited for applications in the oil and gas industry requiring high strength and corrosion resistance. These include downhole and surface gas well components such as tubular products, valves, hangers, landing nipples, tool joints, and packers, as well as fasteners, pump shafting, and high strength piping and hardware.

For more information: Special Metals Corp., Huntington, WV 25705; tel: 304/526-5100; [www.specialmetals.com/newproducts.php](http://www.specialmetals.com/newproducts.php).



## Overlay composite materials protect coal gasification parts

Composite materials that extend the lifecycle of power generation boilers, digesters, scrubbers, and other equipment have reportedly been developed by ArcMelt, St. Louis, Mo. One product the company is considering for protecting gasification equipment consists of powdered tungsten, copper, nickel, cobalt, iron, chromium, titanium, and tin. Called Overlay Composite Structures, the materials can be deposited on a given area up to ten times faster than conventional weld overlays, and last five to seven years, rather than the typical three years. Considerably less material is needed: one pound per square foot rather than the three to five pounds required by welding, and total cost is one-fifth that of welding. These materials can either enhance or replace the protective metal welds and extrusions currently found in these environments.

For more information: Chad Wagner, ArcMelt, 4734 Earth City Expressway, Bridgeton, MO 63044; tel: 850/450-6697; cawagner@arcmelt.com; www.arcmelt.com.

## Global steelmakers advance automotive applications

At a two-day WorldAutoSteel project review summit, global steelmakers combined resources to advance projects that will add to the knowledge database for the development of environmentally responsible automobiles. Speakers at the summit shared results of studies on emerging new steel applications making car bodies lighter, stronger, and safer. Members were also updated on the Future Steel Vehicle (FSV) initiative, a multi-million dollar program that focuses on future power train technologies and their impacts on future steel automotive applications. A state of the art comparison model is being developed to assess comparison of vehicle CO<sub>2</sub> emissions from steel and other competitive materials based on a full Life Cycle Assessment, ensuring sound input for automakers and governmental agencies.

FSV combines the resources of the global steel industry and is a genuine commitment to demonstrate automotive steel performance advantages and to contribute to and invest in innovative new solutions in future steel designs.


For more information: Kathleen Hickey, Communications, WorldAutoSteel, International Iron and Steel Institute, 825 Elliott Drive, Middletown, OH 45044; tel: 734/905-0062; khickey@worldautosteel.org; www.worldautosteel.org.

## Tungsten-filled nylon replaces lead for radiation shielding

Tungsten-filled nylon 12 compounds called Trilliant HC PbF have been developed to replace lead for radiation shielding by PolyOne, Avon Lake, Ohio. The Trilliant HC PbF technologies combine a base polymer – polyamide, polypropylene, polyurethane, or polybutylene terephthalate – with copper, tungsten, or stainless steel filler/reinforcement to achieve a high specific gravity of 2.0 to 11.0 g/cc.

Compared to lead, Trilliant HC PbF compound provides designers with enhanced freedom, including part consolidation. The PolyOne material is able to shield portions of an X-ray tube that are impractical to shield with lead or molybdenum. Molding instead of machining allows an opening for signal and power cables to be completely shielded against radiation leaks. Molded Trilliant parts are also less susceptible to damage than softer lead versions, and with fewer service and field replacements. They are also less brittle than pure tungsten.

For more information: David Honeycutt, PolyOne Corp., 33587 Walker Road, Avon Lake OH 44012; tel: 440/930-3154; David.Honeycutt@polyone.com; www.polyone.com.



Researchers at **Uppsala University, Sweden**, have demonstrated an atomistic mechanism of hydrogen release in magnesium nanoparticles. Magnesium may absorb up to 7.7 wt% hydrogen, and adding catalysts such as iron and nickel can speed the absorption/release process. With the help of computer simulations of magnesium clusters at the quantum-mechanical level, the Uppsala researchers and their colleagues have now been able to show at the atomic scale how this happens and why only a small amount of catalyst can speed the hydrogen release. The extensive simulations were carried out at Uppsala University's Multi-disciplinary Center for Advanced Computational Science (UPPMAX). Contact Professor Rajeev Ahuja, tel: +46(0)70-425 09 35; rajeev.ahuja@fysik.uu.se.

## Polyamides combine impact resistance and high stiffness

Polyamides that are said to balance exceptional impact resistance with good stiffness have been introduced by Rhodia Polyamides, France. Called Technyl SI (Super Impact) they are designed to provide better mechanical properties in high abuse environments. High stiffness brings better structural characteristics to parts and improves screw retention, eliminating the need for Inserts and resulting in ease of assembly, higher productivity, and lower overall cost.

One leading power tool manufacturer has evaluated two formulations of Technyl SI in a highly demanding application, to test performance and processing. The impact modified material not only outperformed the existing application material in terms of impact resistance, but also showed improved stiffness, high dimensional stability, and good surface appearance.

For more information: Christine Bourguignon, Rhodia Polyamide, France; tel: 33 4 72 89 27 53; fax: 33 4 72 89 27 46; christine.bourguignon@eu.rhodia.com; www.rhodia-polyamide.com.