Fuel cell catalyst particles have platinum-rich shell, copper core

A new class of electrocatalyst that could help to improve the capacity of fuel cells is said to be under development at the University of Houston, Texas. The active phase of the catalyst consists of nanoparticles with a platinum-rich shell and a core made of an alloy of copper, cobalt, and platinum. This catalyst demonstrates the highest activity yet observed for the reduction of oxygen.

The active catalytic phase is formed in situ: when a cyclic alternating current is applied to the electrode, the less-precious metals, especially the copper, on the surface of the nanoparticles separate from the alloy. This process results in nanoparticles with a core made of the original copper-rich alloy and a shell containing almost exclusively platinum.

For more information: Peter Strasser, University of Houston, 4800 Calhoun Ave., Houston, TX 77204-4004; tel: 713/743-4310; pstrasser@uh.edu; www.uh.edu.

New Nissan to feature complex aluminum castings

The new Nissan GT-R features aluminum inner-door and rear-seat structures made from Alcoa’s proprietary vacuum die casting process (AVDC) at the company’s plant in Soest, Germany. Both components also feature new proprietary alloys developed by Alcoa. The new C-446 alloy, in combination with the unique advantages of the AVDC process, enabled Alcoa to meet their needs.

The sports sedan’s rear seat structure also presents its own safety performance challenges, in this case strength and stiffness. Here again, Alcoa’s engineers combined specific AVDC process advantages with another new, proprietary alloy, C-611, to meet Nissan’s specifications. The rear seat structure also provides a weight savings of approximately 25% compared to a conventional steel design.

The Nissan GT-R inner door structure is the largest vacuum die casting in the auto industry. In addition to its size, gauge, weight, strength, and deformation demands, the inner door also has some very daunting appearance requirements. Alcoa’s AVDC process provides the company’s structural engineers with the ability to “build in” critical reinforcing ribs where enhanced strength is required, and to “design in” very specific details to help consolidate parts and streamline assembly.

For more information: Alcoa, 201 Isabella Street, Pittsburgh, PA 15212; tel: 412/553-4545; www.alcoa.com; www.nissanusa.com.

Hybrid resins replace 50% of petroleum with biobased starch

A family of resins in which 50% of the petroleum in conventional resins is replaced with bio-based materials such as starches from corn, tapioca, wheat, and potatoes, has been announced by Cereplast Inc., Hawthorne, Calif. With significant content derived from starches, the pricing of Cereplast Hybrid Resins is not as influenced by volatile oil prices as traditional plastics. In addition, Cereplast Hybrid Resins can be processed at the same cycle time as traditional plastics on conventional equipment, but requires less energy in the production process because of significantly lower machine temperatures.

The first resin from the Cereplast Hybrid Resins family, Biopropylene, is based on 50% petroleum and 50% starches, creating similar properties to traditional polypropylene.


Nanometal and polymer combined to make hybrid

A nanocrystalline metal/polymer hybrid called MetaFuse has been designed to build extremely lightweight components by an alliance of DuPont Engineering Polymers, Carpenter Technology Corp., and Titanium Metals Corp. announce joint agreements under which Carpenter will provide specialized titanium conversion processing to Timet, and Timet will supply Carpenter with titanium and scrap melting services.


Diaphorm Technologies makes body armor capable of providing multi-hit protection against armor piercing bullets without shattering. The triple-curve aluminum oxide ceramic plate is bonded inside an advanced thermo-plastic composite cover and backing.

For more information: www.maxpropolice.com.
BRIEFS

Dynamet, a subsidiary of Carpenter Technology, offers Ultrabar, a new line of small-diameter titanium machining bar in diameters from 3 to 12 mm. The bars provide very tight dimensional tolerances and exceptional size consistency and straightness for small, intricate, precision parts made on Swiss-type automatic screw machines. www.cartech.com

E.T. Horn was selected by Kameny Vek to represent and distribute their proprietary basalt fiber exclusively throughout North America. High-performance fiber made from basalt is well suited for demanding composites applications such as wind energy, ballistic, filament wound cylinders and pipes, and infrastructure repair. www.elhorn.com

Goodfellow announces a new product range of leather-fiber-filled thermoplastic elastomer (TPE) in both film and granules, as well as compacted leather fiber granules for addition to polymer compounds. The leather-filled TPE can be processed by extrusion, injection molding or calendaring, resulting in a material that looks, feels, and even smells like leather. www.goodfellow.com

Optomec Inc. announces that the Toolmakers Cluster of Slovenia has purchased its first LENS (Laser Engineered Net Shaping) 850R system. The system was bought by a consortium of companies who are members of TCS, including RITS Ltd., EMO Orodjarna Ltd., and VAUI Store Ltd. www.optomec.com

SABIC has opened a new Energy Center of Excellence in Bergen op Zoom, The Netherlands for the mass production of solar panels. The center is equipped with leading edge design, molding, and testing equipment, and is staffed by engineers, materials scientists, and application development experts. www.sabic-ip.com

Saes Getters S.p.A. announces that it has signed an agreement to purchase from Special Metals Corporation substantially all of the assets of its Shape Memory Alloys (SMA) business. The anticipated acquisition will be made through the newly incorporated Saes Smart Materials Inc., a New York company, which is wholly owned by Saes Getters International Luxembourg S.A. www.saesgetters.com

Morph Technologies Inc., Integran Technologies Inc., and PowerMetal Technologies. The goal of the alliance is to develop and commercialize a material that has the strength and stiffness of metal combined with the design flexibility and lightweight benefits of high-performance thermoplastics.

MetaFuse nanometal/polymer hybrids are based on a proprietary process that precisely applies ultra-high-strength nanometal to components made of DuPont Engineering Polymers, to create lightweight components in complex shapes with the stiffness of magnesium or aluminum but with higher strength.

The patented technology in MetaFuse nanometal/polymer hybrids produces metals with grain size 1000 times smaller than those of conventional metals. Nanocrystalline nickel or nickel-iron are two to three times stronger than conventional steel, and are also significantly harder, with better wear and friction performance. This technology directly creates an integral metal cladding with a nanocrystalline grain structure.

For more information: Carole Davies, DuPont Engineering Polymers, 950 Stephenson Highway, Troy, MI 48007-7013; tel: 248/583-8112; carole.a.davies@usa.dupont.com.

Polyamide combines flowability with high reinforcement volume

An innovative PA 6.6-based technology combining superior flowability together with a currently unmatched level of reinforcement has been introduced by Rhodia Polyamide, France. In addition to unequalled stiffness and temperature resistance, the material offers incomparable processibility. This innovation broadens the range of applications for which replacement of costly polymer or metal solutions with polyamide 6.6 becomes possible. Due to superior flowability, up to 60% reinforcement is possible.

Technyl Star AFX combines high stiffness, strength, and toughness, with high dimensional stability and the long-term retention of properties over a wide temperature range, even in humid environments. Both large and complex parts, and those with thin walls and ribs, will benefit from the very high fluidity of the melt, which offers longer flow lengths, easier cavity filling, and superior surface finish.

For more information: Christine Bourguignon, Rhodia Polyamide, Saint-Fons, France; tel: 334 7289-2753; christine.bourguignon@eu.rhodia.com; www.eu.rhodia.com.

Polyurethane provides strength and heat resistance for bumper

The polyurethane rear bumper assembly of the Audi R8 spans an area of about two square meters, says Bayer Materials Science, Auburn Hills, Mich. The assembly was designed with a plastic-based, lightweight Bayflex 180 polyurethane that had to meet the most stringent requirements, particularly in terms of precision fit and surface quality. The material also had to be extremely tough to ensure resistance to minor collisions.

A special ingredient in the Bayflex 180 material grade is the finely ground reinforcing mineral Tremul 509-304, which is produced for the R8 by Quarzwerke GmbH in Frechen. It helps to produce an excellent component surface and an outstanding paint finish. The material also ensures that the polyurethane system remains extremely tough over a broad temperature range from −30°C to +150°C, thus rendering the rear bumper highly resistant to stone impact. This high thermal stability allows rear panels to be fitted very close to heat-emitting exhaust systems.

Lightweight resins enable Opel Flextreme to save energy

Lightweight polymer material innovations that complement the E-Flex architecture and showcase energy-saving transparent window glazings and lightweight body panel technologies have been developed by Sabic Innovative Plastics (formerly GE Plastics) for the Opel Flextreme and Chevrolet Volt. Polymers include Valox iQ resins for headlamps and connectors; Xenoy iQ resins for body panels; and NextGen Lexan GLX resins with Exatec glazing systems for lightweight glazing.

Lightweight Xenoy iQ resins for large components such as fenders, doors, and hoods, and Valox iQ materials for bezels, door handles, and connectors, enable upcycling or regenerating post-consumer waste such as polyethylene terephthalate (PET) plastic bottles. As a replacement for glass, transparent Lexan glazing offers significant weight savings and enables dramatic new designs while increasing occupant safety.

For more information: Christopher Tessier, Sabic Innovative Plastics, Pittsfield, MA 01201; tel: 413/448-6926; christopher.tessier@sabic-ip.com; www.sabic-ip.com.

Titanium matrix composites to fly on Boeing 787 thrust links

GKN Aerospace has been awarded a contract by Boeing to develop and supply advanced titanium metal matrix composite (TMMC) thrust links for the Boeing 787. This represents the first TMMC component in a commercial application.

TMMC consists of silicon carbide fiber-reinforced diffusion-bonded titanium powder. The result is a hybrid material that is stiffer and stronger than conventional titanium alloys. TMMC offers major weight savings of 25% to 40% over traditional steel or Inconel thrust links, and higher service temperatures than monolithic titanium.

A new TMMC manufacturing process has been developed by GKN Aerospace’s partner, FMW
Composite Systems Inc. FMW developed this cost-effective method of TMMC manufacture by producing its own fiber material, and using powdered titanium in the diffusion process to keep material costs low. The Boeing 787 thrust link will comprise an FMW-manufactured TMMC center tube, which GKN Aerospace will plasma-weld to two machined titanium end lugs.

For more information: Frank Bamford, 550 Warrenville Road, Suite 400, Lisle, IL 60532-4308; tel: 630/737-1456; fax: 630/719-7242; www.gknaerospace.com.

**Thermal composite withstands 1970K on hypersonic vehicles**

TUFROC (Toughened Uni-piece Fibrous Reinforced Oxidation-resistant Composite) has been developed as a new thermal protection system for wing leading edge and nose cap applications at NASA Ames Research Center, Moffet Field, Calif. The composite consists of a toughened, high-temperature surface cap and a low-thermal-conductivity base. It withstands temperatures up to 1970K (1700°C, 3100ºF), and is applicable to both sharp and blunt leading edges. This extends the possible application of fibrous insulation to the wing leading edge and/or nose cap on hypersonic vehicles.

The lightweight system comprises a treated carbonaceous cap composed of ROCCI (Refractory Oxidation-resistant Ceramic Carbon Insulation), which provides dimensional stability to the outer mold line, while the fibrous base material provides maximum thermal insulation for the vehicle structure. The composite has graded surface treatments applied by impregnation to both the cap and base. These treatments enable it to survive in an aero-convectively heated environment of high-speed planetary entry. The exact cap and base materials are chosen in combination with the surface treatments, taking into account the duration of exposure and expected surface temperatures for the particular application.

For more information: David Stewart and Daniel Leiser, NASA Ames Research Center, Moffett Field, CA 94035; tel: 650/604-2954. Refer to ARC-15201-1.