

propane using a pyrolysis process developed by KAT-chem, which Voller acquired last year [FCB, April 2005]. A pyrolyzer is a much simpler reformer that operates without the need for water or steam, and here without using expensive catalysts.

Last October the company successfully demonstrated in its lab a pyrolyzer producing 90 W of hydrogen equivalent – using standard Calor Gas propane as the input. The purity of the hydrogen produced was extraordinarily high. Voller recently signed a joint development agreement with ZBT in Germany to accelerate progress in this area, employing ZBT's considerable knowledge and experience [FCB, April]. In March ZBT completed its feasibility study, validating the design concepts of the Voller pyrolyzer; systems are now under construction for testing and subsequent integration with stack systems.

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Kerafol acquires MEA production, know-how from Fraunhofer IKTS

In Germany, Kerafol Keramische Folien GmbH is taking over the expertise for producing ceramic membrane-electrode assemblies for solid oxide fuel cells from the Fraunhofer Institute for Ceramic Technologies & Sintered Materials IKTS in Dresden.

The technology and quality management for electrode paste production, screen-printing and firing electrolyte-supported MEAs will be transferred to Kerafol in Eschenbach. This will allow the company to position itself as a leading and worldwide operating specialist for electrolyte-supported SOFCs.

The SOFCs can consist of standard materials like partially and fully stabilized zirconia. To increase the power density, scandia-doped MEAs will also be made available. IKTS scientists expect nearly a doubling of the power density, from the current 0.28 W/cm² to 0.45 W/cm² at 850°C and 0.7 V, while still achieving the current level of long-term stability with 0.5% loss of power in 1000 h.

One of Kerafol's core competencies is the high-volume manufacturing of zirconia tapes and substrates for SOFC stacks, electronic devices and sensors for the automotive industry. The company offers substrates and MEAs based on yttria-stabilized zirconia (YSZ) to the world market, and supplies many of the leading

research institutes and companies developing SOFC technology.

The Fraunhofer IKTS is one of the world's leading institutes for high-performance ceramics, and has long experience in developing thick-film cermets and polymer pastes for energy management, sensor technology and microsystems. Its researchers have established scientific fundamentals for designing and manufacturing planar MEAs and stacks, as well as developing technologies such as electrode manufacturing and characterization, glass sealing techniques, the design of interconnector plates including anode and cathode contacts, assembly and initializing of stacks, and 3D simulation.

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ReliOn launches T-1000 and T-2000 backup units

US-based ReliOn has introduced the new T-series, designed specifically for communications backup power applications. The T-1000™ and T-2000™ use the company's patented Modular Cartridge Technology® for scalable, hot-swappable high reliability and ease of maintenance.

The T-1000 is a scalable hydrogen PEM fuel cell capable of providing power architectures from under 600 W_e to 1.2 kW_e, while the T-2000 provides up to 2 kW_e and can be configured to work in combination for power requirements up to 12 kW_e.

Building on ReliOn's modular cartridge architecture, the T-series offers modular electronics cards which allow both scalability and redundancy for higher reliability, as well as easy configuration to either 24 or 48 V applications. The T-series products provide the back-up DC power required by telecoms networks, while reducing or eliminating lead-acid batteries, and providing a significantly increased service life and overall lower maintenance costs of backup power systems.

ReliOn has already shipped its first T-1000 units to a major telecoms network provider, and is currently taking orders for both of the T-series products.

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Smart Fuel Cell raises €15m to fund growth

German-based SFC Smart Fuel Cell AG, a technology and market leader in fuel cells for powering mobile applications, has successfully raised €15 million (US\$19m) in equity capital from several high-profile European institutional investors.

'The fact that renowned institutional investors have chosen to invest in SFC clearly demonstrates the company's attractiveness and potential as an excellently positioned player in an exciting growth market,' says managing director Jens Mueller. The proceeds from the current funding round will enable SFC to develop its organization to the next level.

Founded in 2000, SFC has successfully pursued the development and commercialization of innovative off-grid energy supply solutions based on direct methanol fuel cells. Last year an SFC product became the world's first fuel cell to be fitted as standard in a vehicle: the prestigious Hymer 'S Class' recreational vehicle uses the SFC A50 to provide onboard electricity [FCB, October].

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Oxford chemists demo innovative bio fuel cell

A team of researchers at the University of Oxford in the UK has developed an enzyme-based biological fuel cell that takes oxygen and hydrogen from the atmosphere to power electrical devices.

The enzymes used are isolated from naturally occurring bacteria that have evolved to use hydrogen in their metabolic process. The unique features of these enzymes are that they are highly selective and tolerant of gases that poison traditional fuel cell catalysts, such as CO and hydrogen sulfide. Since the enzymes can be grown, they represent a cheap and renewable alternative to the expensive platinum-based catalysts widely used in hydrogen fuel cells.

The researchers, based in the Chemistry Department and headed by Professor Fraser Armstrong, have built a fuel cell consisting of two electrodes, coated with the enzymes, in a small glass tank containing normal air with a few percent of added hydrogen. Since the catalysts are selective and tolerant the gases can be

mixed, avoiding the need for an expensive fuel separation membrane as is required for many other fuel cell types.

Professor Armstrong says that the latest developments are 'a powerful demonstration of the command we have of the hydrogen fuel cell catalyst which will open up applications beyond the current thinking of the fuel cells community, and I can envisage their use in smart devices.' He adds that the technology has broad applications as a robust fuel cell for many utility applications where cost is a major issue, clean fuel sources cannot be guaranteed, and instant power is required.

'We have been working with Professor Armstrong since the initial promising results a few years ago,' comments Dr Roger Welch of Isis Innovation Ltd, the university's technology transfer company. 'We are delighted to see the invention powering a useful device, in this case a digital watch, and believe that this marks a milestone in the development process to improve the power density and lifetime of the enzymes.'

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European development of fuel cell scooter

Italian scooter manufacturer Piaggio has successfully operated a fully integrated hydrogen fuel cell scooter at its test ground in Pontedera. The 'Fresco' project was coordinated by the ECN Energy Research Centre of the Netherlands, and also involved Italian-based electromechanical systems producer Selin Sistemi SpA and a subsidiary of the French CEA nuclear energy agency; it was partially funded by the European Commission under its Fifth Framework Program.

Scooters are popular vehicles in cities and urban areas all over the world. Reducing the emissions and energy use of these vehicles would offer a significant improvement in air quality and preserving the environment, including reduced noise. Highly efficient fuel cells running on hydrogen and feeding an electric motor form the preferred technology for the longer term. By participating in an R&D project on this technology, Piaggio aims to extend its activities in cleaner propulsion systems that

began with its leading role in the development of hybrid technology.

ECN built the fuel cell engine, Selin Sistemi realized the electric motor and its electronic control unit, and CEA Valduc developed the on-board hydrogen storage tank and refilling facility. The Universities of Pisa and Florence, and the ESMA Company in Russia, delivered additional services and components to the consortium.

Although the Fresco project officially ended in July 2005, an additional effort was made by the project partners and the University of Pisa to enhance the vehicle performance and effectiveness. This work led to new tests in February, which verified vehicle acceleration, maximum speed and range. Earlier fuel cell developments for scooters were limited to small devices for charging an on-board battery, whereas in the Fresco project propulsion relied on the fuel cell alone.

The scooter's maximum speed is 70 km/h (45 mph), with a range of more than 120 km (75 miles). The liquid-cooled PEM fuel cell stack produces 6 kW of electric power, and is used in combination with a 45 Wh supercapacitor, with regenerative braking employed to boost the overall efficiency. The on-board hydrogen supply is a 525 bar (7500 psi) tank with a carbon-reinforced aluminum liner.

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Jadoo adds products for off-grid critical power

California-based Jadoo Power Systems, a leading supplier of portable fuel cell power systems to the professional broadcast market, introduced its expanded line of fuel cell products at the recent National Association of Broadcasters (NAB 2006) trade show in Las Vegas.

The company's new FillOne™ refill station, PowerBase™ desktop support stand and N-Stor360™ fuel canister are intended to make using and refilling fuel cells easy.

Weighing only 1.4 kg and capable of operating with a 12 V_{dc} input, the single-port FillOne refill station provides the necessary rapid refill time for the mobile or independent user. The station can even be directly powered by a fuel cell. The high-performance FillPoint filling station, designed for the high-volume enterprise

user, was introduced at last year's show [*FCB*, June 2005].

The PowerBase support stand readies the fuel cell power unit for use in the field or on the bench. Combined with the new N-Stor360 canister that delivers 360 Wh of energy, customers have everything they need to use fuel cell power with a variety of applications, including field-ready laptops, emergency response radios and other equipment used in extended off-grid situations, including professional broadcast cameras.

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Solvay, CMR in R&D collaboration

UK-based CMR Fuel Cells has entered into a non-exclusive joint development collaboration with European chemicals giant Solvay SA, which is headquartered in Belgium. As a result the Solvay New Business Development division will work to produce high-performance porous membranes for use in CMR's unique high power density 'compact mixed-reactant' fuel cell stacks.

The collaboration aims to develop porous electrolyte membranes that eliminate the requirement for bulky, inactive components found in traditional fuel cells, such as flow-field plates and other balance-of-plant components. The partners say that this use of porous membranes is a world-first for the fuel cell industry, and is protected by CMR's core intellectual property. By developing stacks in this way, CMR is seeking to exploit its patented mixed reactant flow-through architecture to mass-produce fuel cells capable of delivering the high power densities required to produce a commercially viable power delivery system with the potential to replace traditional Li-ion batteries.

The CMR technology is claimed to massively reduce the size of fuel cell stacks, leaving more room for fuel and enabling dramatically longer run-times in portable power systems. Unlike conventional fuel cells, which rely on the complete separation of reactants, CMR's revolutionary design works by flowing a mix of air and fuel through a porous stack that can make use of low-cost catalysts. This approach eliminates up to 90% of the volume and, as the reactants are mixed, the membrane no longer needs to physically separate them and so can be much thinner, lighter and consequently cheaper.

Solvay recently linked up with Umicore to create a new joint venture, SolviCore, for the