

THE **matrix** NEWSLETTER

Powdermatrix 

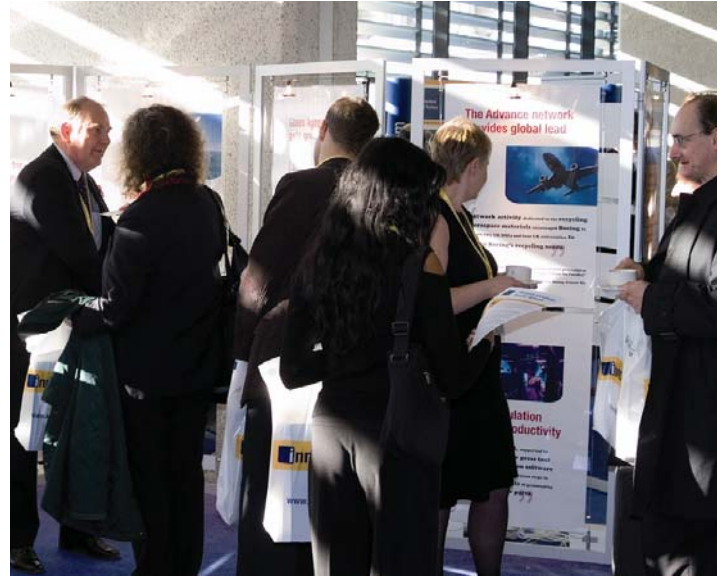
ISSUE 13. Winter 2006

Future Challenges for Advanced Materials

Powdermatrix was very much in evidence at Innovate 2006, which was held in November at the QEII Conference Centre in London. An extensive exhibition showcased the 22 KTNs and other innovation related support. The Materials Knowledge Transfer Network (KTN) stand profiled the Powdermatrix SPARK project between Chapmans Agricultural and Sheffield Hallam, which was also featured in the KTN newsletter, along with our company and sectoral roadmapping.

The event provided UK business with a major opportunity to engage with and understand the Technology Strategy and the role that KTNs are playing in supporting its development.

At Innovate 2006, the Materials KTN workshop discussed the Advanced Materials strategy papers and showcased its contribution to realising the Technology Strategy Board vision for the UK to be a global leader in innovation. The workshop included keynote speeches and Powdermatrix helped to lead group discussions on the "Future Challenges for Advanced Materials". Over 330 delegates had registered to attend the workshop, and on the day, this number was well exceeded.



The keynote speakers presented on materials for the modern built environment; cleaner energy; environmentally friendly transport; healthcare; and smart packaging and retail.

All the speakers' presentations can be found at: www.ktnetworks.co.uk

e-Manufacturing builds bridges

Delegates at a recent Powdermatrix meeting held in association with the Rapid Prototyping and Manufacturing Association (RPMA) were given an intriguing insight into a new, successful application of rapid manufacturing.

Stephen Crownshaw of EOS explained how their DLMS laser-sintering technology is enabling Sirona Dental Systems, the international leading provider of equipment and services for the dental industry, to manufacture customised crowns and bridge frameworks from metal powders. The bio-compatible cobalt-chrome alloy material was developed especially for this application in close collaboration with Sirona. Using laser-sintering technology makes the laboratory significantly more efficient. Dental



Photo Courtesy EOS/Sirona

technicians process about ten crowns per working day using casting. In the EOS DLMS technology, cobalt-chrome alloy powder is sintered directly into the customised shapes required for each patient, directly from CAD data. This use of laser-sintering has enabled Sirona to speed up the process considerably - several hundred frameworks are now built within one day.

*For more information,
contact bob.blake@ceram.com*

Metalysis and Imperial win the case

The Research Committee overwhelmingly awarded this year's Powdermatrix EPSRC CASE studentship to Metalysis and Imperial College for a programme to explore the production and use of NiTi powders by the FFC Cambridge route.

The powders will be made at Metalysis. Their subsequent consolidation will be studied by the techniques and facilities at Imperial currently used in the Powdermatrix supported programmes there on titanium powder consolidation.

The new student, Ben Jackson, will join two existing Powdermatrix Associates, Dave Tricker and Fatos Derguti, at Imperial working with Martin Jackson, Jane Minay and Richard Dashwood. Ben is currently in the US working in the Oil Industry following a successful MSc at MIT and will start his investigations in the new year.

*To discuss Powdermatrix CASE Awards contact: Powdermatrix,
steve.harmer@ceram.com
Imperial College London, martin.jackson@imperial.ac.uk*

Core partners:

| CERAM | Institute of Materials, Minerals and Mining | EPMA | British Hardmetals Research Group | NPL
| University of Birmingham | University of Manchester | Loughborough University

High pressure casting

Industrial Waste Reduction Through Development of High Pressure Casting Process.

Following successful feasibility work, the DTI Technology Programme has given almost £600,000 support to a four year, £1,273,000 programme to fully develop pressure casting techniques for a range of applications across the advanced ceramic and refractory industrial sectors. The project is led by CERAM and involves several PowdermatriX members.

The project will primarily focus on substrates which would normally be manufactured by the tape casting fabrication process. Work will include recipe development and optimisation to ensure components can meet process efficiency targets whilst maintaining essential product quality specifications. A prototype pressure casting machine will then be designed, built and commissioned before the process is operated on-site at two end user facilities to evaluate its viability as an alternative to existing manufacturing options.

The DTI Zero Emissions Enterprise is looking at novel and innovative ways of reducing gaseous, liquid and material waste. Water based pressure casting will provide near net fabrication capability to reduce waste costs plus the ability to operate efficiently as a non-solvent based process.

For more details of the project contact steve.kessel@ceram.com

Jet nozzles take the pressure

A PowdermatriX SPARK project undertaken by Ecka Granules Metal Powders Ltd. in partnership with Aston University has developed a prototype high performance jet nozzle for gas atomisation with potential for a 30% improved process yield.

The high performance nozzle uses high pressure gas to suppress shock waves and improve the energy transfer from gas to melt flows. This innovation reduces the freeze-off phenomena which has detrimental effects on product yield.

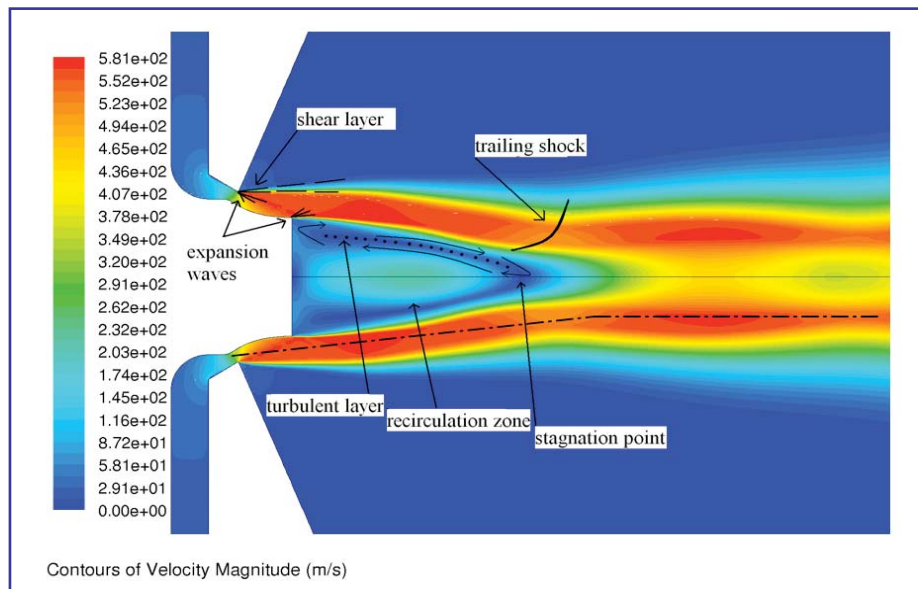
The nozzle design is based on the aerodynamic theory of plug nozzle. CFD models have evaluated its performance against its predecessor and indicate a 30 per cent improvement on product yield by narrowing the powder distribution. The results also show that the gas consumption can be reduced 25% by increasing the gas temperature from 300 to 500 K.

Ecka Granules will now continue to test the nozzle in its gas atomisation tower and plan to design a completely new gas atomisation system. Aston is continuing to support Ecka's R&D activities through a PowdermatriX EPSRC CASE project.

Mark Wall, Operations Director, Ecka Granules Metal Powders, commented, "Nicola Zeoli has performed excellently with the design of the new nozzle at Aston. The theory behind the technology is impressive. Initial trials have shown that the nozzle needs to be refined and we plan to test the modified design to achieve the higher yields in the new year."

Ecka Granules Metal Powders: [Mark Wall, m.wall@ecka-granules.com](mailto:Mark.Wall@ecka-granules.com), or [Mark Pulcella, m.pulcella@ecka-granules.com](mailto:Mark.Pulcella@ecka-granules.com)

Aston University: [Dr. Sai Gu, School of Engineering, Aston University, s.gu@aston.ac.uk](mailto:Dr.Sai.Gu@aston.ac.uk)



Titanium MIM gets platform at EuroPM

PowdermatriX continues to be committed to fostering interest in the emerging field of Titanium Powder Metallurgy.

At the recent EPMA Euro PM2006 conference in Ghent, a special Workshop on Metal Injection Moulding (MIM) of Titanium was sponsored and jointly organised by PowdermatriX.

The 85 attendees heard presentations on the challenges to be addressed by MIM in developing markets for titanium, and the market impact already created by European suppliers in the biomedical and aerospace sectors, as well as an appraisal of the suitability of a range of titanium powder feedstocks for MIM processing.



Prototype Novel Heart Valve Prosthesis; TiJet Medizin Technik GmbH

In a final discussion on powder supply issues, it was concluded that, to attack the MIM markets of current interest, enhancing powder quality was more important than reducing powder cost. It was also recognised that PM as a whole needed to develop titanium material standards rather than continue to compare titanium PM products with ASTM standards for wrought products.

Looking forward, PowdermatriX will be co-sponsoring (along with the Institute of Materials, Mining & Minerals, Namtec and Timet) a 2-day Titanium Event on January 8 and 9, 2007.

This event, at University of Birmingham, will provide an overview of industry drivers and challenges for titanium products, through presentations covering a range of sectors, will assess the current academic research portfolio and will then seek to generate a Titanium Technology Roadmap.

Contact: david.whittaker@ceram.com for details of the PM2006 seminar and Titanium Event.

Farhad goes with the flow

Farhad Motazedian is currently working at the University of Leicester as an Industrial CASE student working alongside industrial partners; S.G.Magnets, Morgan and Filtronic Comtek.



Farhad applied for the CASE sponsorship when it was advertised at the University of Leicester, attracted by his background in metallurgy. Having worked as a materials science engineer in Iran he was familiar with different production techniques and he had studied powder metallurgy in particular.

Farhad's CASE project involves researching the flow and compaction of particulate materials. Die filling is a major part of this project and he is extensively studying suction filling in particular. Powder compaction behaviour in different loading paths is also going to be studied. The project will benefit companies in the ceramic sector, magnetics, powder metallurgy and pharmaceutical industries as the way particles pack significantly affects the final product behaviour. The project forms part of the Engineering the Green State initiative, which involves a total of six universities and twenty industrial partners.

Farhad has been working on the project for two years and is seeing some consistencies in the experimental results. It is planned that true commercial benefits will be identified by the end of this academic year. Farhad's work will contribute to the Engineering the Green State project's aim to provide a tool box which can be used for designing and predicting compaction behaviour and will enable more rapid product development.

Farhad particularly enjoys the responsibility that comes with the CASE sponsorship as, although the partners and sponsors are in regular contact and able to give advice and guidance, Farhad is working on his own initiative.

The project is due for completion in September 2007 but Farhad is optimistic that this area of research will develop and said; "I can see a lot of potential for this project both in terms of the academic side and the practical side as industries are persuaded to adopt the technology. Suction filling with multi level punches as well as powder transfer and compaction in situ are areas for future research."

Farhad has a BSc in metal forming and an MSc in material selection, both of which he gained from studying at the Shiraz University in Iran.

Farhad is a family man, and when not hard at work on the CASE project he enjoys relaxing with his wife and young son.

KTN continues to grow

Although only officially launched in January this year, the Materials KTN was pleased to announce at Innovate 2006 that it recently reached a milestone of 4,000 members.

The Materials KTN has grown further, with the approval from the DTI, to set up a Design node. The group, put together by the KTN in partnership with the Institute of Materials, Minerals and Mining, Royal College of Arts, Design Council, Institute of Engineering Designers and the Engineering Employers Federation, is to be known as "Materials and Design Exchange". The KTN now has the opportunity to work with the Regional Development Agencies (RDAs) and businesses to contribute to the implementation of the Design for Business programme and ensure that all enterprise and innovation support recognises the role of creativity and design in the manufacturing and use of materials.

For more information on the Materials KTN, please visit www.materialsktn.net or contact Louise Morgan, Relationship & Marketing Manager, email: louise.morgan@iom3.org, Tel: (01476) 514596.

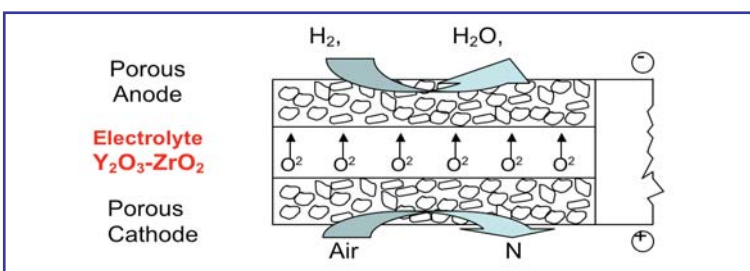


Loughborough adds Fuel to Research

Work is currently ongoing in IPTME at Loughborough University on the production of thin electrolytes for solid oxide fuel cells (SOFCs).

The goal is to investigate the potential offered by creating a nanostructured electrolyte via screen printing. This is based on a recent development, for which a patent application has been made by the Loughborough team, of a new process for making yttria stabilised zirconia (YSZ) nanosuspensions that have high solids contents, up to 75 wt%, but which display low viscosities, typically ~ 2 mPa s. To date the work has focused on the production of a suitable ink from the nanosuspensions; en route an aqueous version of the current solvent-based submicron particle-based ink has been developed. The lessons learnt here are now being applied to the nano-ink so that the rheology of the inks can be manipulated to achieve the correct viscoelastic and pseudoplastic properties. Future work will look at the constrained sintering of prints and the effects of the grain size on the ionic conductivity of the electrolyte.

For more information, contact Prof. Jon Binner, IPTME, Loughborough University; j.binner@lboro.ac.uk





PowdermatrixX Research Committee initiative launched

A Research Committee initiative is developing the support offered to PowdermatrixX members for technology transfer and R&D.

The PowdermatrixX Research Committee has an important role in guiding our activities to members; research and development projects, technology roadmapping, meetings and workshops.

A recent meeting of the committee's members and Technology Translators focused on the future for PowdermatrixX activities in promoting innovation support.

Drawing views from both industry and academia, the committee identified the activities that would provide maximum benefit for members and would contribute to the long-term stability of PowdermatrixX.

David Pulling, Chair of the Research Committee and Managing Director, Corporate Services, GKN, observed "The away day stimulated some very constructive discussions, particularly about the way the Research Committee can help PowdermatrixX to deliver value to its Members. There was plenty of enthusiasm, and as a result, our future meetings will be much better focussed on the important issues."

*For more information, contact
stuart.maclachlan@ceram.com*

PowdermatrixX Annual Event

Following positive delegates' response, we are returning to Holywell Park, Loughborough on 6th March 2007 for our annual event.

There will be plenty to hear and see; technology updates on flagship EPSRC and DTI projects, new initiatives and project opportunities, interactive sessions.

Our annual meeting has consistently proved an excellent opportunity for delegates not only to learn about emerging technologies and services, but also to help develop contacts and ensure that PowdermatrixX will produce an even greater impact in the future.

Note "6th March" in your new diaries and watch out for registration details in the New Year. We look forward to seeing you in Loughborough!

For details of the event see the PowdermatrixX web site, www.powdermatrix.org or contact Ann Barratt, ann.barratt@ceram.com

Events Listing

Dates in Full	Event	Venue	Organiser	Contact
8th - 9th January 2007	Titanium Roadmapping Event	Birmingham	IOM3, Namtech, Materials KTN	Nicola Radford: 01709 722 477
6th March 2007	PowdermatrixX Annual Meeting	Loughborough	PowdermatrixX	ann.barratt@ceram.com
16th - 17th April 2007	First International Direct Writing Conference	Durham	Direct Writing Association	info@directwriting.co.uk
2nd - 5th September 2007	Soft Magnetic Materials Conference	Cardiff	Cardiff University	smm18@cardiff.ac.uk
15th - 17th October 2007	EuroPM 2007, Congress and Exhibition	Toulouse	EPMA	info@epma.com

Add a Colleague

If one of your colleagues would like to receive the PowdermatrixX newsletter, please email their name and address with 'matrix' entered into the subject box to powdermatrix@ceram.com

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