

# THE **matrix** NEWSLETTER

## PowdermatrixX

ISSUE 7. Spring 2005

## PowdermatrixX Declares Successful Revolution

**A capacity audience made PowdermatrixX Revolution, our annual review, a lively and successful event.**

Despite snow storms, 120 delegates from industry and leading universities attended the meeting, which was held at Holywell Park, Loughborough. In welcoming them, Dr. John Liddle, PowdermatrixX Director, described how, in a relatively short time, PowdermatrixX was demonstrating a positive influence on the particulate engineering sectors and developing a portfolio of longer term research projects.

Throughout the day, there was plenty to hear and see;

- Industry Members highlighted the significant benefits from the 15 SPARK award projects PowdermatrixX had funded for problem solving and feasibility studies.
- The five flagship project groups supported by EPSRC and DTI described industrially focused research as varied as mathematical modelling to improve process capability, innovative nano materials for better component

properties, and improved coatings and magnetic materials for energy efficient aircraft engines.

- Interactive sessions reviewed the recommendations of the recently published PowdermatrixX Technology Roadmaps and produced a series of actions to advance the sectors.

In addition, details of new funding initiatives for PowdermatrixX members in 2005 were released. A call for Industrial CASE studentships gives companies a further opportunity to work with top research departments. A second round of SPARK awards, each worth £5,000, will establish up to 12 projects to help industry take the first steps in developing innovative ideas.

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



*Sarah Maude (Faraday Associate, Loughborough University) receives the award for the Best Associate Presentation from John Liddle, PowdermatrixX Director.*



### You too can benefit from SPARK Awards

**The second call for proposals for PowdermatrixX SPARK awards is now underway. Aimed at helping Members improve their industrial performance, the £5,000 awards support problem solving, proof-of-concept, technology demonstration and other development activities by subcontract research providers and university departments.**

In 2004, fourteen awards covered a wide range of technical areas including hydrogen storage, prosthetic implants and rapid tooling. Moreover, projects were not confined to the materials engineering sectors. Critical Pharmaceuticals worked with the University of Nottingham, School of Chemistry.

The project investigated the properties and performance of composite powders used for depot injection in the pharmaceutical industry produced by Critical

Pharmaceuticals' solvent free formulation technology.

Dr. Martin Whitaker, Operations Director, Critical Pharmaceuticals said, "The SPARK award enabled our company to carry out research work that we would not otherwise have been able to do. The aim of the work was in response to customer interactions from the US regarding the loading of excipient within Critical Pharmaceutical's polymeric formulations. The data generated gave a robust answer to the customer's questions and will be invaluable in business development discussions. We intend to continue the work with a CASE Award."

Contact your Technology Translator or see the PowdermatrixX website to see how you too can benefit from SPARK awards.

**For more information contact:**  
**SPARK Awards:** ([powdermatrix@ceram.com](mailto:powdermatrix@ceram.com))  
**Critical Pharmaceuticals:**  
([martin.whitaker@criticalpharmaceuticals.com](mailto:martin.whitaker@criticalpharmaceuticals.com))

### Core partners:

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

# Nano Mission is on the Move

Supported by the DTI and working with the Global Watch service, PowdermatriX is co-ordinating a technical mission on Nanomaterials manufacture and application taking place from 18 - 22 April 2005.

It will visit centres of technical excellence in Finland, Germany and Switzerland assessing:

- the state of development of nanomaterials and their impact on product manufacture and performance
- potential applications and issues that companies adopting nanoparticles should consider

During the visits the mission members will evaluate:

- Future powder supply
- The ease of making components with nano powders
- The real effects on component properties
- The forecast market impact

Watch out for further reports on progress.

We will be holding a dissemination event later on in the year.

*For more information on the mission contact:*

[stuart.maclachlan@ceram.com](mailto:stuart.maclachlan@ceram.com)



## Characterisation Meetings are Underway

The second in a series of PowdermatriX powder characterisation seminars focused on powders in suspension. In addition to hearing about familiar techniques like rheology measurement, the 35 delegates were introduced to lesser known methods such as Focused

**Beam Reflectance, which offers real time data, and Small Angle X-ray Scattering, which enables suspended nano-particle measurement.**

A clinic session led by Ron Buxton of Particle Technology Ltd gave strong support for future meetings. The next event will present case studies of industrial applications for analytical techniques in solving production issues. We aim to discuss issues from the food and pharmaceutical sectors as well as ceramics and powder metal.

*For more information on the next meeting contact: [phil.jackson@ceram.com](mailto:phil.jackson@ceram.com)*



## MIM Points way Forward for Medical Devices

**A recent interest group at Sheffield University reviewed Metal Injection Moulding (MIM) and its ability to mass produce small, complex metal parts with excellent mechanical properties.**

Several manufacturers of medical devices learnt about the technique from presentations from each of the UK MIM producers, who were represented at the meeting. Chris Conway of MIM manufacturer Egide UK Ltd said "getting the process known to users of small, precision metal components is important". The medical devices manufacturers discussed the pros and cons of MIM, and are now in a much better position to make decisions on its future use in their products.

*For further details of MIM activities, contact: [bob.blake@ceram.com](mailto:bob.blake@ceram.com)*



## Training Database Goes On-Line

PowdermatriX Revolution saw the launch of the Training Database. Located on the Members' Pages of [www.powdermatrix.org](http://www.powdermatrix.org), you can search for short training courses on topics related to powder metals, advanced ceramics, magnetics and hardmetals as well as other powder-

**related subjects. Currently you will find details of over 100 courses from 15 institutions and the database is continually expanding.**

Jon Binner, Chair of the PowdermatriX Training Committee, welcomed this facility as a valuable resource to companies seeking to develop the technical capability of their staff.

*If you have courses you would like including, please contact: [stuart.maclachlan@ceram.com](mailto:stuart.maclachlan@ceram.com)*



# The Future's Green

**Supported by the EPSRC and 23 companies, spanning all of Powdermatrix's materials sectors, "Engineering the Green State" is developing fundamental understanding of the process steps for making green compacts by die pressing.**

All 6 project modules are now underway. Individual modules are considering powder blending and formulation, powder transport and delivery to fill shoe, die filling, pre-compaction powder transfer, compaction and ejection.

Early results include: Leicester University's work on experimental observation of gravity die filling has extended to assess the effects of powder fluidisation in the shoe.

The improvement in critical velocity for complete die fill has been quantified. A method for tracking segregation during filling and powder transfer has also been developed. Leicester and Manchester Universities have

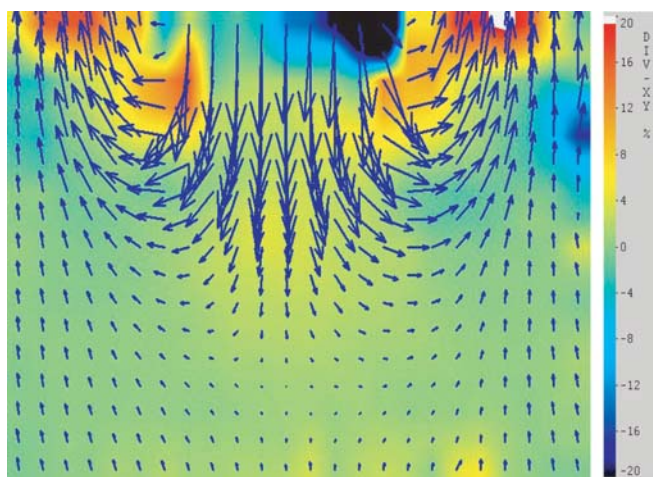
tracked powder flow during pre-compaction transfer of Al-10%Sn using X-ray tomography (the tin addition provided "markers" to follow the flow). This has provided ideas on dilatation strains during transfer around punch corners.

Loughborough University work has concluded that, for acceptable flow in die filling, dry nano-powders must be pre-agglomerated.

Work has therefore focused on producing "soft" agglomerates that will break down during compaction and given encouraging early results with spray dried powders.

The modelling group at Aberdeen University has focused initially on developing a constitutive model for low pressure, early stage compaction where the influences of air escape are expected to be most significant.

Dr Paul Nurthen of Hogan's, the Industrial Chair of the Project Steering Board says "I anticipate that this



project will contribute significantly to understanding the factors controlling segregation in powder mix creation and delivery to the forming process. This would then put compaction modelling on a much more realistic footing."

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## SPARKS Fly to Generate Spin-offs

**Networking at last year's annual meeting, Powdermatrix Reloaded, led Harry Hodgson, Dynamic-Ceramic Ltd and Hywel Jones, Sheffield Hallam University to identify the potential of zirconia composites which could be machined and shaped in a new way.**

The materials would be developed at the Materials and Engineering Research Institute (MERI) at Sheffield Hallam utilising the furnaces at the University of Warwick while the zirconia expertise and materials were supplied by Dynamic-Ceramic Ltd. Disappointment followed as a joint SPARK proposal submission to investigate the technique of Electro-Discharge Machining (EDM) was not selected for funding. Undeterred, Sheffield Hallam was able to

provide internal Knowledge Exchange funding so that the university and the company could begin development of these new composites. Several new grades of zirconia composites have been produced and characterised and work is underway to assess their ability to be shaped using EDM and their compatibility with the proposed applications. The partners are now seeking sources of further funding for the project to develop working products and test them in real applications.

**For further details contact:**

**Dynamic-Ceramic Ltd: Harry Hodgson**  
[harry.hodgson@dynacer.com](mailto:harry.hodgson@dynacer.com)

**Sheffield Hallam: Hywel Jones**  
[a.h.jones@shu.ac.uk](mailto:a.h.jones@shu.ac.uk)

## It's Win-Win with Powdermatrix

**Everyone employed on research programmes supported by Powdermatrix automatically becomes an Associate of the Faraday Partnership; a scheme that benefits both the Associates and Powdermatrix members.**

Firstly, Technology Translators monitor the Associates' progress not only in research, but also in training for their professional development and awareness of industry requirements. Secondly, the Technology Translators' understanding of members' needs ensures the best opportunities for technology transfer and industrial

exploitation from the Associates' research by Powdermatrix members.

With the second year of postgraduate appointments now complete, newcomers Christine and Matthew (Aberdeen), Prasanna (Greenwich), Quiang and Nikolaos (Birmingham), Farhad (Leicester), Nicholas (London), Michael (Manchester) and Andrew (Loughborough), photographed at their induction meeting on 17 November, have now swelled the total number of Associates to nineteen.





## Titanium Workshop on Prague Agenda

This year's EuropePM event in Prague will host a special workshop initiated by PowdermatriX on the subject of "Potential for Titanium in PM". Chaired by Dr Elena Gordo of University Carlos III Madrid the workshop will include speakers from

across Europe and from a range of commercial and academic organisations.

It will examine the status of current technology relating to the applications of Titanium PM and examine the potential objectives and mechanisms for developing this area of technology.

EuroPM 2005 will be held from 2-5 October at the Prague Congress Centre, Czech Republic.

Further details are available from the EPMA by email via [Frances.Holland@epma.com](mailto:Frances.Holland@epma.com)

## Thumbs-Up for PowdermatriX

The results of the recent membership survey show that the vast majority of PowdermatriX members think we are doing a good job and 40% replying to a recent survey thought that PowdermatriX had added tangible value to their organisation.

Members particularly value presentations from meetings, reports and technical notes and considered PowdermatriX a useful forum for information exchange. The quality and quantity of contact with members, whether physically or electronically, is thought to be about right. We depend on members' views to ensure the services we offer provide real benefit and we will be carrying out more member surveys to canvass your views.

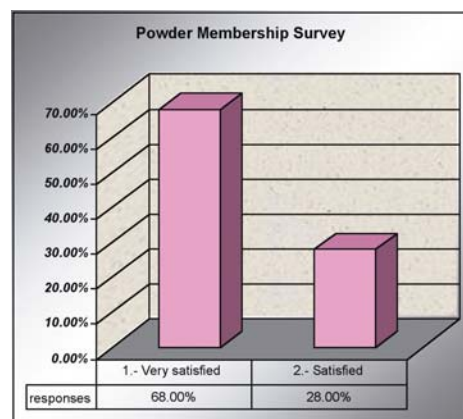


## Tooling meeting

If you are involved in die pressing of products from powder, a toolmaker supplying to these manufacturers or a powder supplier, our one-day Awareness Meeting on Tooling and Die Compaction will interest you.

On 10 May 2005 at CRDM, High Wycombe, the programme covers developments in tooling materials and coatings, rapid toolmaking techniques, lubrication methods and alternative die filling technologies, and includes a tour of CRDM's rapid manufacturing facilities.

For further details of the meeting see the PowdermatriX web site.



### Forthcoming events

#### Nanomaterials Manufacturing and Applications

April 2005, Europe, Mission

- PowdermatriX [powdermatrix@ceram.com](mailto:powdermatrix@ceram.com)

#### Pneumatic Conveying Bulk Materials

26 - 27 April 2005, Greenwich, Short Course

- University of Greenwich [www.bulksolids.com](http://www.bulksolids.com)

#### Tooling and Die Compaction

10 May 2005, High Wycombe, Awareness Meeting

- PowdermatriX [powdermatrix@ceram.com](mailto:powdermatrix@ceram.com)

#### Electrophoretic Deposition: Fundamentals and Applications

29 May - 3 June 2005, Braga, Italy, Conference

- ECI and ECERS [engconfintl.org](http://engconfintl.org)

#### Powder Metallurgical High Performance Materials

30 May - 3 June 2005, Austria, Conference

- Plansee [www.plansee.com](http://www.plansee.com)

#### Particulate Systems Analysis 2005

21 - 23 September 2005, Stratford-upon-Avon, Conference

- Particle Characterisation Interest Group, Royal Society of Chemistry [www.psa2005.com](http://www.psa2005.com)

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PowdermatriX is a Faraday Partnership providing industry focused technology, research and training

**Faraday Partnership**