

# advanced materials

see the results  
see for yourself...



## ...see the difference world class facilities and skills can make to your business

### Global Challenge

The opportunity to identify, create, and exploit new materials to meet the challenges we face in health, engineering, energy and environment has never been greater. The scope from exploiting the possibilities of nano materials, through characterising new materials to understanding the associated process issues spans all sectors. Applying this knowledge to metals, polymers, composites, ceramics, semiconductors and pharmaceuticals will be central to future economic growth across a number of strategic sectors.

### Birmingham Science City

To facilitate access to the latest thinking, research and equipment in advanced materials Advantage West Midlands have invested over £20M in the development of a range of new facilities and equipment.

The establishment of these new facilities is part of the larger investment by Advantage West Midlands and ERDF in the research infrastructure of the West Midlands region, which unites the Universities of Birmingham and Warwick in a newly-formed Science City Research Alliance.

The initiative also includes investment in research on Translational Medicine and Energy Futures.

It reinforces the West Midlands region as a leading centre of expertise in research and technology.

# real tangible now

## Advanced Materials

This project is led jointly by the University of Birmingham and the University of Warwick, but involves many other partners and Universities. It focuses on a number of key areas in both nano and bulk functional materials:

- Creating and Characterising the next generation of Advanced Materials
- Innovative Uses for Advanced Materials in the Modern World
- Processing of Advanced Materials

## Getting Involved

The aim of the project is to encourage industrial and academic collaboration and joint research.

It provides an opportunity for businesses and industry to access the latest thinking, research and equipment in the field.

The objective is to encourage more rapid development of new technologies and to ensure that the West Midlands region is positioned to benefit from future industrial and research investment.

## What Next

To find out how your business could benefit from the programme contact:

**Richard Simpson**  
Business Engagement Manager  
University of Birmingham  
Research and Commercial Services

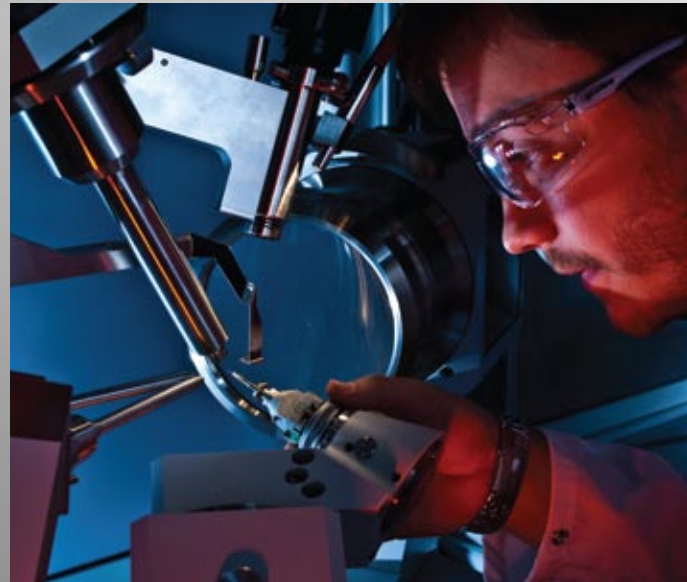
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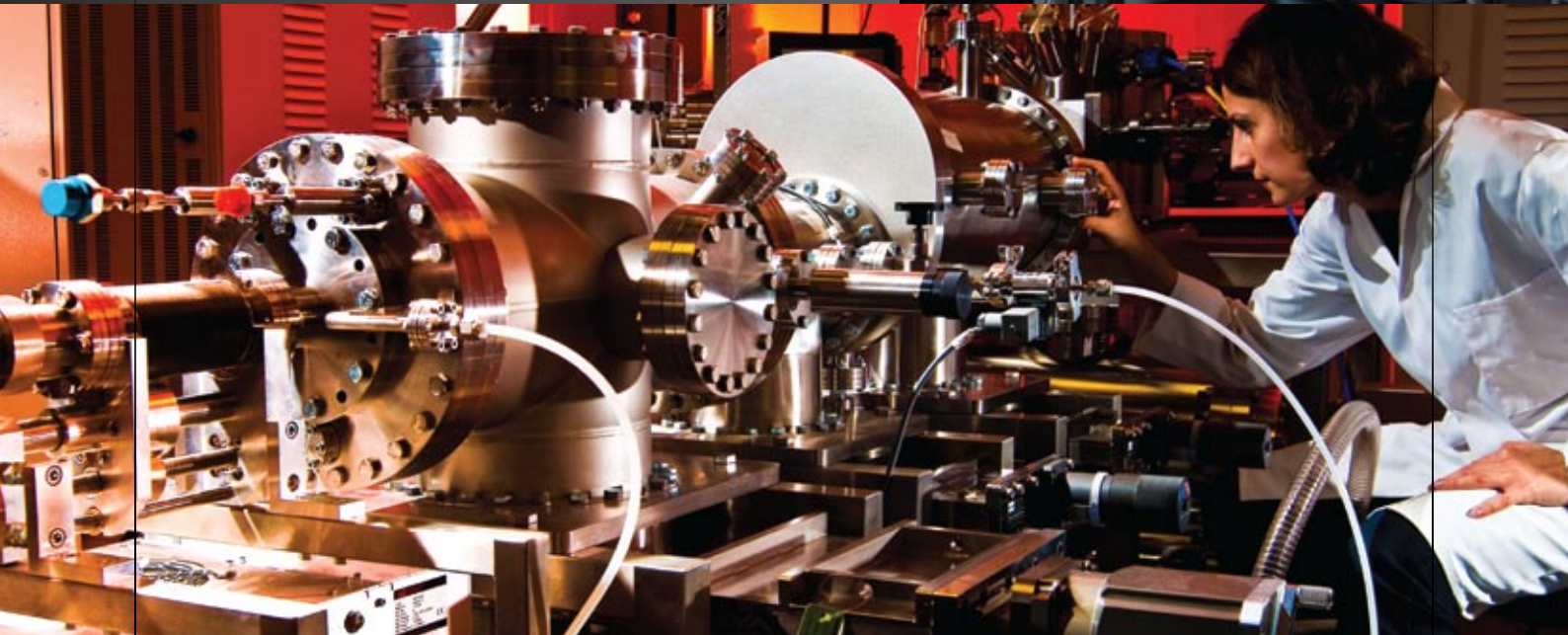
Mobile: 07824 541 172  
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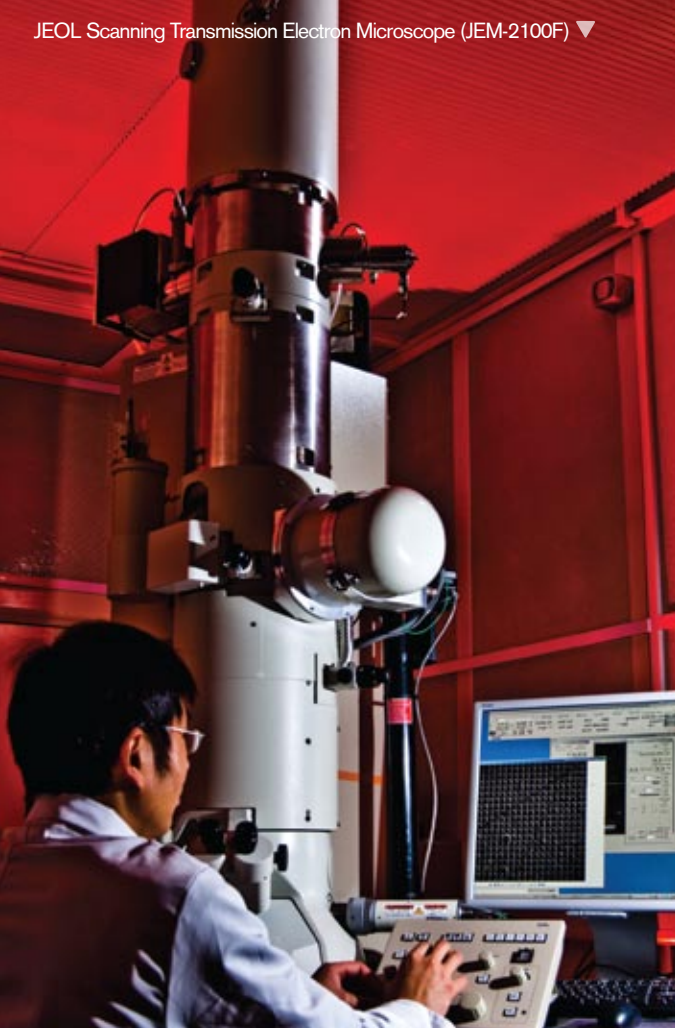
Size selected cluster beam to produce nano particles ▼

Positioning a specimen for single crystal x-ray diffraction to determine the material's crystal structure ▼



Autosampler loading on Bruker D8 X-Ray Diffractometer ▼





# superconducting smaller, lighter, faster

## Company Background

3-Cs has developed and patented novel manufacturing processes for depositing superconducting thin films onto rotating proprietary cylindrical substrates for the next generation of very high power density electrical machines. Electric motors, generators, transformers, magnets etc will be more powerful, compact and lightweight than ever before. The implications for aerospace and defence are enormous, and the wider commercial applications include the energy, transport, medical and industrial processing sectors.

Dr Eamonn Maher, MD and Founder of 3-Cs, wished to gain access to the specialist high resolution, high flux configuration of the Panalytical X'Pert Pro Materials Research Diffractometer at the University of Warwick in order to help monitor and optimise key manufacturing processes under development at their Malvern site.

This was arranged through the Birmingham Science City programme resulting in Dr. Phil Hirst, Principal Scientist at 3-Cs, having regular access to the Warwick equipment and being trained in its use. The large area XRD characterisation technique complements the in-house EBSD detailed mapping technique

which 3-Cs already has in-house for investigating epitaxially grown films, and will result in an increased understanding of the growth processes required to produce large area superconducting structures.

*"We have supported the concept of Science City right from the beginning and now that we have been able to benefit directly from the scheme we have no hesitation in recommending it to any small business needing access to the facilities and expertise at the universities of Birmingham and Warwick."*

*"Great care was taken by the Business Engagement Manager, Richard Simpson, in understanding our business needs and technical requirements and in making the right introductions. All this was accomplished in short order, and we were able to get on with the job and lay the groundwork for improving our manufacturing processes. It really is a pleasure to deal with such high-quality people and we look forward to collaborating more in the future."*

**Dr Eamonn Maher**  
MD - 3-Cs Ltd

Examining fluorescent markers on plant roots using laser scanning confocal microscopy. ◀ The tunable white light laser enables a wide variety of such markers to be studied

## optimisation for product formulations

Science City researchers at The University of Birmingham have been working with Unilever UK. Unilever is one of the world's leading suppliers of fast-moving consumer goods. Their three global divisions cover foods, home care and personal care. Within the personal care market, they are global leaders in products for skin cleansing, deodorants and antiperspirants. Unilever employ 179,000 people in 100 countries worldwide and invest 1 billion every year on research and development.

Science City researchers have been working with Unilever to investigate the distribution of active ingredients for the application for personal hygiene products. The work has made use of one of the many state-of-

the-art pieces of equipment that has been made available as part of the Science City programme, a Confocal Raman Microscope. Raman microscopy, and in particular confocal microscopy, has very high spatial resolution and Raman imaging is a powerful technique for generating detailed chemical images based on a sample's Raman spectrum.

Raman spectra were acquired using an infrared laser source together with two-dimensional maps of the distribution of product ingredients. A wide variety of Raman images were created which take the researcher well beyond what the eye can see.

This analysis has provided beneficial information for the future optimisation of

effective product formulations. The University of Birmingham has one of the largest concentrations of Chemical Engineering expertise in the UK, with an excellent reputation in learning, teaching and research. Its Chemical Engineering School is within the top five of the country. It combines global experts in their field, together with leading edge facilities and laboratories.

*"Working with the researchers at University of Birmingham has been a real benefit to our business and their expertise is invaluable. We look forward to continuing this relationship."*

**Nick Ainger, Unilever R&D, UK**

Birmingham Science City

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