



EPSRC

Engineering and Physical Sciences
Research Council

Issue 3, 2015

The third newsletter updating the ceramics community on news and progress of an EPSRC programme grant on Materials Systems for Extreme Environments, XMat

 UNIVERSITY OF
BIRMINGHAM

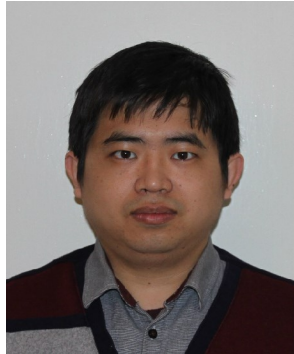
Imperial College
London

 Queen Mary
University of London

People – XMat



Sam Humphry-Baker joined the XMat team in September 2014 as a Postdoctoral Associate in the Department of Materials at Imperial College, London. His work is focused on cemented metal-ceramic composites as shielding materials for nuclear reactor applications. His research interest in nuclear materials began at the University of Oxford (MEng, 2005-2009), where he studied radiation-induced segregation in tungsten alloys, using atomic scale characterisation techniques. Later, at the Massachusetts Institute of Technology (PhD, 2009-2014) he worked on the synthesis and thermal stability of bulk nanostructured thermoelectric compounds processed via a powder route.



Ji Zou joined XMat in Oct 2014 as a Research Fellow in the School of Metallurgy and Materials at the University of Birmingham. His work is currently focusing on the green forming and densification of ultra-high temperature ceramics. Prior to this he did his PhD at the Shanghai Institute of Ceramics, Chinese Academic of Science and after that he worked as a Research Fellow, first in KU Leuven, Belgium and then Stockholm University, Sweden. His main interest is in the processing-microstructural tailoring-property of advanced ceramics.



Allie Hardwick joined the XMat programme in July 2015 as a research administrator, replacing Keely Austin. She has previously worked for the University of Birmingham as a Facilitator within the Institute of Microbiology & Infection and has also worked as a Haematology Data Manager at the QE Hospital and administrative roles at the University of Worcester.

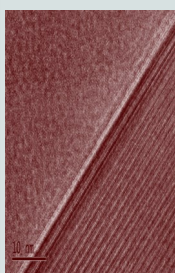


Luke Davis has recently changed roles in EPSRC and has become the Portfolio Manager for Materials Engineering. He is the new EPSRC contact for the XMat programme.



Oxyacetylene torch test

“To establish in the UK the capability to develop new materials that can operate under increasingly extreme conditions, thus enabling a wide range of new technologies”



HRTEM image—
Hf₂Al₄C₅

Out and About

Jon Binner presented Keynote lectures on Ultra-High Temperature Composites at the German Ceramic Society, DKG, Annual Meeting in Bayreuth, Germany, March 2015; the Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications III, Gold Coast, Australia, April 2015, and ECERS XIV, Toledo, Spain, June 2015. He also gave an Invited Talk at the Ceramics for Energy Workshop in Faenza, Italy in May 2015. During the meeting he also visited ISTE.

Bill Lee gave a Keynote lecture at the Intl. Symp. on Ceramics Nanotune Technology, ISCeNT 4, Nagoya Institute of Technology, Nagoya, Japan, on “Structural Ceramics for Extreme Environments”, March 2015.

In August 2014, Mike Reece visited Prof D.K. Kim’s research group in KAIST, South Korea, to discuss common interests in UHTC. In April 2015, he visited ISTE, Faenza and gave talk on UHTCs. Mike also visited

the European Space Agency in June 2015.

Mike Finnis was invited as a visitor at ICAMS (Interdisciplinary Centre for Advanced Materials Simulation), Ruhr-Universität Bochum, August – October 2014, developing contacts there, and with other visitors from the MPIE in Düsseldorf, The Centre for Advanced Ceramics (TU Hamburg), and the Materials Department in UCSB.

Mike is a co-organiser together with Michele Ceriotti of Symposium D3.1 “Atomistic Modelling” at EUROMAT 2015 (<http://euromat2015.fems.org/scientific-programme-details/>)

Denis Horlait gave a keynote talk on *Synthesis, Characterization and Oxidation Testing of MAX Phases in the Cr-Ti-Al-C System and of Zr₂AlC-Based Compounds* at the 39th ICACC conference, Daytona Beach, Florida, January 2015.

Doni Daniels was invited as a Visiting Academic to the Nuclear Reactor Research Labs, Tokyo Institute of Technology, in Nov. 2014 to

collaborate on MAX phase research for ATF applications. He gave an invited talk at the Japan Aerospace Exploration Agency on *Ultra High Temperature Ceramics Research*.

Salvatore Grasso gave a Keynote presentation in August 2014 on *Field Effects in Electric Current Assisted Sintering (ECAS) Techniques*, Sintering 2014, Dresden, Germany.

Theresa Davey gave a talk on *Fully Anharmonic First Principles Data in the Assessment of the B-C-Hf-Zr System*, in CALPHAD 2015 in Loano, Italy, June 2015.

Virtudes Rubio presented a paper on UHTC Monolithics, UHTC Composites and Graphite by Oxyacetylene Torch Testing, at ECERS XIV, Toledo, Spain, June, 2015.

Andrea D’Angio presented a poster at MST ’14, October 2014, Pittsburgh, PA, USA. The title was *Microwave Heated Chemical Vapour Infiltration of Ultra-High Temperature Ceramics*.

Visitors - XMat programme

Prof Theodre Bessmann from the University of South Carolina visited Imperial College between the 11th and 22nd May 2015. During his stay, he had many technical discussions with the XMat researchers and gave a talk on *Chemical Evolution of Oxide Nuclear Fuels*.

Prof Bill Fahrenholtz from Missouri University of Science and Technology, Rolla, visited the University of Birmingham between the 19th May and 11th June,

2015 during a sabbatical. He interacted with all of the XMat researchers and joint research is now being undertaken. Bill also visited Imperial College, had discussion with staff and researchers and gave a talk on *Reactive Hot Pressing of Zirconium Diboride: Densification Behavior and Thermal Properties*.

Prof Guo-Jun Zhang from Shanghai University, China, visited Queen Mary University London and gave a talk on the 14th July on

ZrB₂-SiC Ultra-high Temperature Ceramics - from Microstructure Tailoring to Property Improvements.

Prof Takao Mori from NIST, Japan visited Queen Mary University on the 16th July 2015. He gave a talk on Functionalization of Ultra-high Temperature Ceramics; Development of High Temperature Thermoelectric Materials.

ACerS' PCSA

Well done Theresa Davey and Andrea D'Angio (XMat PhD researchers) for representing the team at an ACerS' President's Council of Students Advisors (PCSA) delegates during 2014-2015.

Theresa continues her role this academic year (2015-2016) as well. As a member of the Communications Committee, she wrote a short article for the Deciphering the Discipline column in the Bulletin of the American Ceramics Society, called 'United or Divided? A student perspective from the United Kingdom'. This was published in the December 2014 issue (Vol 93, No. 9).

She is also the PCSA Divisional Delegate to the Refractory Ceramics Division of ACerS, and have just been selected as part of the leadership committee of the ACerS GGRN.



PCSA members with the outgoing president of ACerS (Arrows indicate Theresa and Andrea from the XMat team)

XMat Industry Day



The first **XMat INDUSTRY DAY** was held on the 13th February 2015 at the University of Birmingham with attendees from industry and university (NNL, Tokamak, NPL, DSTL, Lucideon, Rolls-Royce, AWE, Morgan Advanced Materials, Precision Ceramics, Adelan, University of Birmingham, Imperial College and Queen Mary University London). There were presentations and research posters from industrial and academic members.

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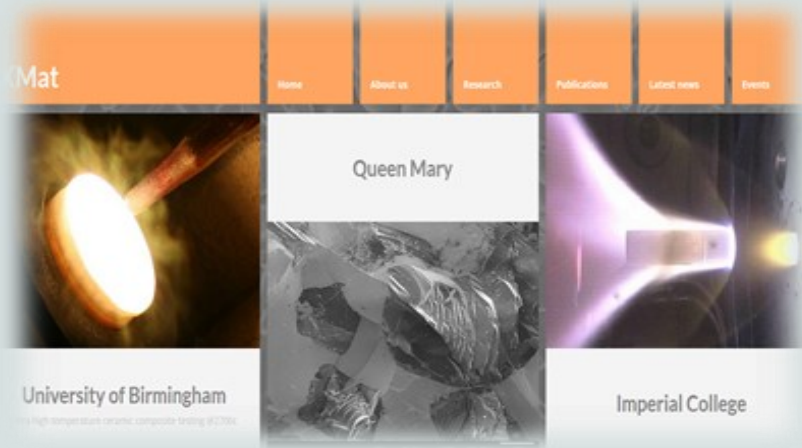


People - XMat

Prof Jon Binner, University of Birmingham
(Principal Investigator)
Prof Bill Lee, Imperial College London
(Co Investigator)
Prof Mike Finnis, Imperial College London
(Co Investigator)
Prof Mike Reece, Queen Mary University London
(Co Investigator)



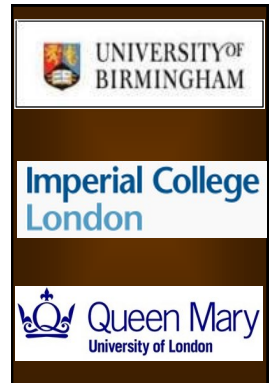
Further Information : For more information please contact Dr Amutha Devaraj (Technical Manager, ICL adevaraj@imperial.ac.uk) or Ms Allie Hardwick (Administrator, UoB a.b.hardwick@bham.ac.uk)



<http://www.xmat.ac.uk>

COLLABORATORS – XMat (EPSRC Programme)

XMat is entirely collaborative. The team includes academics at Imperial College London (ICL) and Queen Mary University London (QMUL), UK, and is led by the University of Birmingham, UK. Around 25 other organisations are involved in the project, including industry, government bodies and overseas universities.



FUTURE EVENTS

15-16 October 2015	Annual Meeting	University of Birmingham
25-28 September 2016	INTERNATIONAL WORKSHOP on Theory and Modelling of Materials in Extreme Environments	Coseners, Abingdon, Oxfordshire

Other interests :

XMat publications: <http://www.xmat.ac.uk/publications/>
XMat related future meetings: <http://www.xmat.ac.uk/events/>