



***Designing Alloys for Resource Efficiency***  
***A Manufacturing Approach 4***

**Halifax Hall, The University of Sheffield**

**11 & 12 February 2020**





**13.30 – 15.00**

**Presentations**

**Dr Junheng Gao**, Department of Materials Science and Engineering,  
Sheffield University, UK

***A new grain refinement strategy to achieve both high strength and large ductility in a TWIP steel***

**Mr Hossein Eskandari Sabzi**, Lancaster University

***Strategies for the design of steels for additive manufacturing***

**Mr Thomas Kwok**, Imperial University, London

***How low can you go – The TWIP steel manganese limbo***

**15.00 – 15.30**

**Tea and coffee**

**15.30 – 17.00**

**Presentations**

**Dr Peng Gong**, Department of Materials Science and Engineering, The  
University of Sheffield

***Effect of aging on the microstructural evolution in a new design of maraging steels with carbon***

**Mr Greg Clarke**, Strategy & Business Development, Liberty Steel

***Residuals management using the value in use model as a basis and a perspective on scrap management opportunities***

**Dr Lucy Smith**, Advance Resource Efficiency Centre  
(AREC), The University of Sheffield

***Sustainability Assessment for Resource Efficient Alloys***

**18.00**

**Drinks and SCEnAT-AR Challenge**

**19.00**

**Dinner**

## **Wednesday 12<sup>th</sup> February**

**9.00 – 10.30                      Presentations**

**Dr Nick Weston**, Department of Materials Science and Engineering,  
Sheffield University, UK

***Exploiting field assisted sintering technology for resource efficient,  
next generation components.***

**Dr Xin Xu**, Department of Materials, Imperial College, UK

***A high yield strength TWIP+TRIP Ti alloy***

**Dr Felicity Freeman**, Department of Materials Science and  
Engineering, Sheffield University, UK

***Additive Manufacture of Magnetically Graded Materials***

**10.30 – 11.00                      Tea and coffee**

**1.00 – 12.30                      Presentations**

**Prof Raymundo Arroyave**, Department of Materials Science and  
Engineering, Texas A&M University, USA

***Efficient Exploration of the High Entropy Alloy Space***

**Prof Russell Goodall**, Department of Materials Science and  
Engineering, University of Sheffield, UK

***High entropy alloys for brazing***

**Prof Pedro Rivera**, LPW/RAEng Research Chair, Lancaster University

***New martensite theory to design TRIP/TWIP Ti alloys***

**12.30                                      LUNCH and close**

## ***Welcome - Professor Mark Rainforth***



After obtaining a 1st Class Honours degree from the University of Sheffield, Mark Rainforth initially followed an industrial career. He later joined the Department of Materials Science & Engineering in Sheffield from the University of Leeds in 1989 and rapidly established state-of-the-art facilities in electron microscopy and tribology. He is co-author of the book 'Ceramic Microstructures' with W E Lee, a winner of the Rosenhain Medal of the IoM3. A former President of the Royal Microscopical Society he became a Fellow of the Royal Academy of Engineering in 2016. His research centres on the high resolution characterisation of microstructures, in particular interfaces and surfaces. His research programmes are broadly based and cover metals, ceramics and coatings.

## ***Recrystallisation and Texture Evolution in Mg alloys – Dr Dikai Guan***



Dr Dikai Guan commenced as a Postdoctoral Research Associate on the DARE programme in April 2015 after completing his PhD in Materials Science at the University of Sheffield. His research focuses on the theme "Magnesium (Mg) Alloys that are less dependent on Rare Earths"; it mainly revolves around the understanding of how Rare Earth elements work in Mg alloys and finding replacement elements which will produce weak basal texture Mg alloys that are cost and resource efficient.

## ***Microscopic origins of plastic anisotropy in magnesium: some new theory and the role of calcium – Professor Tony Paxton***



Tony's research interests are in nanoscale and microscale modelling of structure property relations in structural and functional materials. He is also interested in atomistic simulation of water and chemical processes in aqueous solution, both catalysis and corrosion. In addition to being a Profssorr in the Department of Physisc at Kings College London he is also a visiting professor in the Department of Materials at Imperial College

London.

### ***Micromechanics of twin nucleation and growth in Mg alloys – Mr Chaitanya Paramatmuni***



Chaitanya is a PhD student in the Department of Materials at Imperial College London. His research interests are based on integrated modelling and experimental approaches that provide insights into micro-mechanics of materials. He is currently working on strain-rate sensitivity, stress relaxation and twin nucleation in magnesium based alloys, which relates to the DARE research theme "Magnesium Alloys less dependent on Rare Earths".

### ***A new grain refinement strategy to achieve both high strength and large ductility in a TWIP steel – Dr Junheng Gao***



Currently, Junheng is a Royce@Sheffield Alloy Development Engineer after spending 4 years on the DARE programme as a Research Associate. His research interests are in the design of new steels for auto application, in particular ultrafine-grained TWIP steels and nanostructured steels, and their thermomechanical treatments for microstructural optimization to achieve superior combination of strength and ductility.

### ***Strategies for the design of steels for additive manufacturing - Mr Hossein Eskandari Sabzi***



Hossein Eskandari Sabzi is a PhD student in the Engineering Department at Lancaster University, United Kingdom. He obtained his BSc and MSc from the University of Tehran, Iran. His master's research was on the thermo-mechanical processing of high manganese transformation-twinning induced plasticity steels. His PhD project focuses on the design of new alloys for additive manufacturing, working on grades of stainless steels, maraging steels and nickel superalloys.

### ***How low can you go – The TWIP steel manganese limbo - Mr Thomas Kwok***



Thomas Kwok is currently a 3<sup>rd</sup> year PhD student at Imperial College London, under the supervision of Professor David Dye. His research revolves around the design of high strength medium manganese steels for energy absorption applications. Emphasis is placed on keeping costs low and employing an industrially viable thermomechanical process. Prior to this he obtained a BEng in Materials Science and Engineering from Imperial College London and spent 2 years as a research engineer at the Singapore Institute of Manufacturing Technology (SIMTech).

### ***Effect of aging on the microstructural evolution in a new design of maraging steels with carbon – Dr Peng Gong***



Peng has worked as a Research Associate on the DARE programme since June 2016, focusing on the development of higher strength resource efficient steels for lighter road vehicles. Her research is concerned with the process-microstructure-property relationships in various kinds of steel, including the design, characterisation and analysis of new types of AHSS steels and the development of new Eurofer steels.

### ***Residuals management using the value in use model as a basis and a perspective on scrap management opportunities – Mr Greg Clarke***



Greg has worked in the steel industry for over 20 years and is currently the Manager for Strategy and Business Development within Liberty Speciality Steels. He has had a varied career to date with experience within Steelmaking/Semi finished products; Manufacturing Management; Transport and Shipping; Laboratory Management; and most recently Strategy & Business Development (Business Transformation, Mergers & Acquisitions, Strategy Deployment, Operational Excellence). He holds a Masters Degree in Materials Engineering from UoSheffield, an MBA with Distinction from UoWarwick and is a Gold Award Business Excellence Assessor.

### ***Sustainability Assessment for Resource Efficient Alloys – Dr Lucy Smith***



Dr Lucy Smith is a Doctoral Prize Fellow at The University of Sheffield. Her work focusses on the sustainability of materials and products throughout the supply chain and contributes to understanding how the interdisciplinary nature of the triple bottom line (the environment, economy and society) is affected throughout the circular economy. Lucy has conducted complex Life Cycle Assessments at both industrial and laboratory based levels. Lucy has previous experience as an Environmental Manager, working in the steel and cement industries, where she implemented and managed environmental management systems and permits.

### ***Exploiting field assisted sintering technology for resource efficient, next generation components – Dr Nick Weston***



Nicholas Weston is a Research Associate in the Department of Materials Science and Engineering at the University of Sheffield. He obtained an MEng in Aerospace Engineering in 2011 and a PhD in Metallurgy in 2017, both from the University of Sheffield. He became a Research Associate in 2016 working as part of the Sheffield Titanium Alloy Research group. His principal research interest is the solid-state downstream processing of titanium alloy powders and particulates, to produce low-cost titanium alloy components.

### ***A high yield strength TWIP+TRIP Ti alloy – Dr Xin Xu***



Xin Xu is a Research Associate in the Dept. of Materials at Imperial College London working on titanium alloys and high strength steels. Prior to this he studied for a PhD and then had a position as a Research Associate at the Hero-m Centre in the Dept. of Materials Science & Engineering at KTH Royal Institute of Technology, Sweden. His research interests revolve mainly around alloy design using advanced techniques including electron microscopy and neutron scattering etc.

### ***Additive Manufacture of Magnetically Graded Materials - Dr Felicity Freeman***



Felicity Freeman is a Research Associate at the University of Sheffield, currently working on feedstock control for direct energy deposition. She completed her PhD in 2019, where she investigated how the build parameters can be exploited to deliver microstructural control in laser powder-bed fusion. Before moving into academia, Felicity spent over a decade in industry, specialising in non-contact metrology for single-crystal turbine blade castings.

### ***Efficient Exploration of the High Entropy Alloy Space - Prof Raymundo Arroyave***



Raymundo Arróyave is a Professor in the Department of Materials Science of Engineering at Texas A&M University. His interests are in computational materials science with emphasis on phase stability, kinetics and phase transformations. He is also interested in simulation-assisted materials design as well as in novel approaches that leverage machine learning and AI to discover and design new materials.

### ***High entropy alloys for brazing - Prof Russell Goodall***



Russell Goodall is a metallurgist with extensive experience in the science of porous metals, and the development of novel alloys of many types. He has worked for over 15 years on the processing and thermal and mechanical characterisation of a range of new materials. In 2019, Russell received the Sir Colin Humphreys Education Award by the Institute of Materials, Minerals and Mining (IoM3).

### ***New martensite theory to design TRIP/TWIP Ti alloys - Prof Pedro Rivera***



Pedro Rivera is the LPW/Royal Academy of Engineering Chair in the Lancaster Intelligent, Robotic and Autonomous Systems Centre, University of Lancaster. His research focuses on developing new principles in physical metallurgy and microstructural modelling, the development of high performance steels and the modelling and design of new alloys.