



Engineering and
Physical Sciences
Research Council



International Student Conference in



Organised by the EPSRC and SFI
Centre for Doctoral Training in
Advanced Metallic Systems

11 – 12 July 2022
The Helix
Dublin City University



Monday 11th July

9:00 Registration & Refreshments

9:30 Welcome – Gallery Room

Professor Dermot Brabazon, AMS CDT ROI Director, Dublin City University

Keynote

Dr Nesma T. Aboulkhair, The University of Nottingham

‘Metal Additive Manufacturing: From Loose Powder to Complex 3D Structural and Functional’

10:20 Parallel Session 1

1A – Gallery Room

Advanced Processing and Characterisation

Chairs: Lucy Farquhar & Sam Lister

10:25 Development of Advanced High Modulus Steels for Automotive Applications

Sully Khan, The University of Sheffield

10:40 Additive Manufacturing for the Development of Microneedle Arrays as Minimally Invasive Drug Delivery Systems

Nikoletta Sargioti, Dublin City University

10:55 Order-Disorder Transformation Control in AlTiVCr-Based High Entropy Alloys

Panagiotis Stravroulakis, The University of Sheffield

1B - Blue Room

Corrosion and Surface Engineering

Chairs: Sakina Zaman & Huda Al-Jurani

Producing Precious Metal Doped Stainless Steels by Spark Plasma Sintering

Natasha Sweeney Fort, The University of Sheffield

Understanding the Effect of Strain on Microstructure Properties and Environmental Degradation of AGR Fuel Cladding

Alexander Hanson, The University of Manchester

The Use of Nanosecond Pulsed Laser Modification for the Increased Lifetime of a Commercially Used Pulsed Electric Field (PEF) System

Mark Swayne, Dublin City University

11:20 Refreshment Break - Atrium

12:00 Parallel Session 2

2A - Gallery Room

Microstructural Design

Chairs: Joshua Collins & Ashley Scarlett

2B - Blue Room

Alloys & Brazing

Chairs: Frances Livera & Xavier Sanuy Morell

12:05 Spreading Area Measurements of Sn-Ag-Cu Lead Free Solder on Silver and Copper Substrates

Wunmi Olukoya, The University of Sheffield

12:20 The Evolution of Microstructure and Toughness in Multipass Welds that Contain Acicular Ferrite

Enn Veikesaar, The University of Manchester

12:40 Modelling the Microstructure Evolution of Titanium Alloys

Guy Bowker, The University of Manchester

Tool Wear in CVD Coated Carbides when Machining Ni-based Superalloys

Henry Boyle, The University of Sheffield

In Situ Characterisation of the Thermomechanical Deformation Behaviour of Powder Processed Ni-based Superalloys

Frances Synnott, The University of Sheffield

Characterisation of Zirconium Alloys with Copper and Vanadium Additions for Nuclear Fuel Assembly Materials

Callum Andrew, The University of Manchester

13:00 Lunch and Poster Presentations - Atrium

14:30 Keynote – Gallery Room

Professor Andrew Parnell, Maynooth University

‘Anomaly Detection and Other Machine Learning Tools in Industry 4.0’

15:20 Parallel Session 3

3A - Gallery Room

Demanding Environments & Energy

Chaired by Sakina Zaman & Kavi Sharma

15:25 Development of an Optical Fibre Mid-Wave Infrared Thermometer for Metal Machining Operations

Emilios Leonidas, The University of Sheffield

15:40 Computational Study of Microstructurally Short Crack Propagation in AA7XXX Alloys

Cameron Grant, The University of Manchester

15:55 Modelling the Behaviour of Irradiation-Induced Defects in Nuclear Zirconium

Jake Larkin, The University of Manchester

3B - Blue Room

Machine Learning & Data Analysis

Chaired by Anesu Nyabdaza & Bryan Naab

Measuring Image Quality of 3D X-Ray Computed Tomography

Jamie McGregor, The University of Manchester

Design of HEA Hardmetals for Tooling Applications

Joshua Berry, The University of Sheffield

Anti-Ice Fouling Surfaces by Fabrication Superficial Structures on Aluminium Alloys by Laser Machining

Abhijit Suhas Cholkar, Dublin City University

16:10 Refreshment Break - Atrium

16:40 Ultrashort Laser Sintering of Metallic Nanoparticle Inks on Heat Sensitive Substrates

Ayesha Sharif, National University of Ireland Galway

16:55 Effect of Microstructure on the Localised Corrosion of 15-5PH Stainless Steel

Alyshia Keogh, The University of Manchester

Molecular Dynamics (MD) Simulation of TWIP/TRIP Metals and Alloys

Mehran Bahramyan, Dublin City University

Microstructural Fingerprinting via Variational Autoencoders

Mike White, The University of Sheffield

17:15 Drinks Reception – Atrium

6pm Coach departs for transfer to Conference Dinner

Conference Dinner and Irish Dancing Experience

Arlington Hotel, 23-25 Bachelors Walk, O'Connell Bridge, Dublin 1

A 3-course menu will be served.

Starter options: Duck Salad, Soup, Prawn Salad or Cantaloupe Melon

Main options: Irish Lamb Stew, Boiled Bacon, Chicken Supreme, Salmon, Bean Chilli, or Beef & Guinness

The coach will depart The Arlington at 10.30pm to return delegates to their hotels.



Tuesday 12th July

9:00 Refreshments & Posters - Atrium

9:30 Welcome – Gallery Room

Professor Russell Goodall, AMS CDT UK Director, The University of Sheffield

Keynote

Professor Claire Davis, Warwick Manufacturing GP at The University of Warwick
'Rapid Alloy Development for Sustainable Steels'

Announcement by Dr Richard Dawidek, Royce at the University of Sheffield, on
'Royce Researcher & Student Equipment Access Schemes'

10:20 Parallel Session 4

4A - Gallery Room

Modelling and Simulation

Chairs: Guy Bowker & Mike White

10:25 An Investigation into the Effect of Microtextured Regions on the Fatigue Properties on Forged Titanium

Patrick Curran, The University of Manchester

10:50 The Development of a Rapid CCT Predictor for Low Alloy Steels

Joshua Collins, The University of Manchester

11:10 The Influence of Prior Deformation and Creep Asymmetry on Stress Relaxation and FE Modelling of Creep Age Forming AA2139 Plate

Kevin Tanswell, The University of Manchester

11:20 Refreshment Break - Atrium

12:00 Parallel Session 5

5A - Gallery Room

Modelling and Simulation

Chaired by Joshua Collins & Frances Livera

Session 4B - Blue Room

Additive Manufacturing & Sustainability

Chairs: Lucy Farquhar & Nikoletta Sargioti

3D Printing of Continuous Stainless-Steel Fibre/Polymer Composites

Alison Clarke, University College Dublin

Methodologies Used in the European Countries for Critical Raw Material Assessment

Ahmar Murtaza, Dublin City University

Pulsed Laser Ablation in Liquid for the Fabrication of Magnesium and Carbon Nanoparticle Inks

Anesu Nyabdaza, Dublin City University

5B - Blue Room

Additive Manufacturing & Sustainability

Chaired by Vincent Kan & Josiah Chekotu

**12:05 Coupling Component Diffusion with the
Precipitation Kinetics of Ni-Based
Superalloys**

Sakina Rehman, The University of
Manchester

**12:20 Modelling the Effects of Texture on the
Stress and Strain Localisation During
Bending of Aluminium Alloy Sheet**

Laura Gonzalez Duque, The University of
Manchester

**Influence of Solution Heat Treatment
Temperature and Holding Time on the
Microstructure, Texture, and Hardness of
IN718 Produced by the L-PBF**

Merve Nur Dogu, Dublin City University

**Microstructural Influence on the Fatigue
Behaviour of Additively Manufactured
Ti64 Alloy**

Bryan Naab, University College Dublin

**12:40 Closing Session - Gallery
Keynote**

Declan Bourke, Product Development Manager, Fort Wayne Metals
'Nitinol Processing and Applications - Current State of Arts, Trends, and Challenges'

Poster & Oral Presentation Prize Awards – Professor Russell Goodall

13:30 Lunch - Atrium

15:30 Coach transfer to airport

Keynote Speakers

Metal Additive Manufacturing: From Loose Powder to Complex 3D Structural and Functional Products

Dr Nesma Aboulkair, The University of Nottingham

Biography

Dr Nesma Aboulkair works in metal AM using various technologies, such as using droplet-on-demand technologies (Metal Jet) to jet high temperature electrically conductive molten metals into micron-scale features. Her projects span a range of alloys using powder-based laser AM technologies, focussing on the process-structure-property relationships, incorporating extensive experience in parameters optimisation and control for successful fabrication of defect-free parts and characterisation of the microstructural and mechanical behaviours.



Abstract

Metal additive manufacturing is strongly positioning itself as a predominant player in today's manufacturing landscape. With the unmatched degrees of freedom this family of manufacturing processes warrant, fabricating sophisticated components that was otherwise unachievable has become possible. This talk will give an overview of the recent advances in metal additive manufacturing activities currently taking place at the newly established Additive Manufacturing laboratory at the Technology Innovation Institute (TII) in the UAE. Focussing on the process-structure-property relationships in metal additive manufacturing via laser powder bed fusion, our research avenues include 3D Printing of high-performance metals, next generation materials for laser powder bed fusion, and redesign via additive manufacturing to exploit the potential of light-weighting and engineering bespoke mechanical performances.

Anomaly Detection and Other Machine Learning Tools in Industry 4.0

Professor Andrew Parnell, Maynooth University

Biography

Andrew is Hamilton Professor in the Hamilton Institute at Maynooth University. His research is in statistics and machine learning for large, structured data sets in a variety of application areas. He has co-authored over 75 peer-reviewed papers and has been involved in grants totalling over €65 million as PI/collaborator. He has been heavily involved in the commercialisation of research through the start-up companies Prolego Scientific and Atturos. He is currently a principal investigator in the SFI I-Form Advanced Manufacturing Centre, and a funded investigator in the SFI Insight Centre for Data Analytics.



Abstract

Many processes which fall under Industry 4.0 provide the operator with an enormous amount of data for every manufactured part. It can be very hard to reason with data sets of this size and dimension, let alone make informed decisions about whether a part has been produced to a desired quality level. In this talk, I will provide a tour of some of the methods developed and used by the I-Form Centre for Advanced Manufacturing (www.i-form.ie). I will explain how some of these machine learning tools work, and how they can be used to identify anomalies in real time for an additive manufacturing process.

Rapid Alloy Development for Sustainable Steels

Professor Claire Davis, The University of Warwick

Biography

Professor Claire Davis holds a RAEng / Tata Steel Chair in Low Energy Steel Processing and is the Head of the Advanced Steel Research Centre (ASRC) in WMG, University of Warwick. The ASRC focusses on fundamental and applied research from steelmaking to final product and is a group of over forty researchers. Professor Davis's personal research interests are on the development of microstructure during processing and the relationships between microstructure and properties (both physical and mechanical) in steels. She also works on non-destructive evaluation of microstructure using electromagnetic sensors.

**Abstract**

How can the academic community support the rapid development and adoption of new steels and processes in the steel industry? The drive to lower CO₂ emissions means that there are changes occurring in the steel industry, which include introduction of new steelmaking processes and an increase in recycling as well as the continued demand for improved steels. To support these changes, for example through considering the implication of increased residual elements from recycling and to develop new steels / processes laboratory facilities and modelling need to be capable of replicating industrial processing. In this talk rapid alloy processing for steel will be discussed, with examples of how industrial process parameters are considered and how residual elements affect the steels' microstructure and properties.

Nitinol Alloy Processing and Applications – Current State of Art, Trends, and Challenges

Declan Bourke, B.E. (Mech), M.Eng. Sc., Product Development Manager, Fort Wayne Metals Ireland

Biography

Declan is currently undertaking a PhD on laser bed powder fusion nitinol on a part-time basis, at the department of mechanical engineering at DCU. Declan has worked for the past 17 years at FWMI in various process engineering, quality engineering and R&D roles. Fort Wayne Metals is a leading manufacturer of metal products for medical devices and high specification industrial applications. The company has evolved to a fully integrated system of melt, production, and across 17 facilities in the U.S. and Ireland.



Abstract

FW Metals offers a range of alloys – including NiTiNol, titanium, cobalt chromes, stainless steels, and high-performance alloys – for a wide spectrum of materials and forms, including round wire, shaped wire, bar, rod, sheet, strands, cables and assemblies. These products are for use in a wide range of medical devices such as cardiovascular, neurostimulation, orthopaedic and orthodontic applications, as well as a number of high specification automotive, aerospace and general industrial applications. One of the fastest growing alloys in terms of demand and range of applications is nitinol. An overview of current state of the art processing of nitinol, its properties and applications are covered in this presentation. Challenges and limitations are identified with respect to current subtractive manufacturing processes, and challenges and opportunities are identified regarding Additive Manufacturing (AM) for production of high specification nitinol components.

International Student Conference in Metallic Materials 2022

Prize Awards

Presented by Professor Russell Goodall



SCAN TO VOTE

for the

BEST POSTER

and

BEST ORAL PRESENTATION



University College Dublin

EPSRC & SFI Centre for Doctoral Training in Advanced Metallic Systems

The University of Sheffield

Dublin City University

The University of Manchester

University College Dublin

Connect with us

enquiries@metallicscdt.co.uk

cdt@i-form.ie

