Hydrogen Fundamentals and Material Challenges

Agenda

7-10 May 2024, Cranfield University campus, Building B115 LR2

Tuesday 7th May – *"Setting the scene: the hydrogen supply chain"*

9:00-9:45	*Delegates arrival, coffee and refreshments*	
9:45-10:00	**Introduction to the course**	Francesco Fanicchia (CU)
10:00-10:30	**The importance of understanding hydrogen material challenges to decarbonise aviation**	Louise Gale (RR)
10:30-11:30	**Testing for hydrogen embrittlement**	Alan Turnbull (NPL)
11:30-11:45	*Break*	
11:45-12:45	**Electrolysis and fuel cells**	Indrat Aria (CU)
12:45-13:45	*Lunch*	
13:45-14:45	**Materials for Hydrogen Storage and Transport**	Krzysztof Koziol (CU)
14:45-15:45	**Standards for Hydrogen Storage and Transport**	Charlie Hutchings (FN)
15:45-16:00	*Break*	
16:00-17:00	**Hydrogen internal combustion engines**	Aaron Costall (CU)

17:15-18:30	*Lab visits (Composites Centre + HyPER)*

Wednesday 8th May – *" Material Challenges, mechanisms and testing methods "*

09:00-10:00	**Hydrogen production methods**	Upul Kahagala Gamage (CU)
10:00-11:00	**Physics of Hydrogen and fundamentals of hydrogen transport**	Francesco Fanicchia (CU)
11:00-11:15	*Break*	
11:15-12:15	**Physics of Hydrogen and fundamentals of hydrogen transport**	Francesco Fanicchia (CU)
12:15-13:15	**Hydrogen embrittlement**	Gustavo Castelluccio (CU)
13:15-14:15	*Lunch*	
14:15-15:15	**Hydrogen embrittlement**	Gustavo Castelluccio (CU)
15:15-16:15	**Fundamentals of hydrogen permeation in composites**	Stefanos Giannis (NPL)
16:15-17:15	**Material properties and testing at cryogenic temperatures**	Huw Edwards (ATI)

18:30	***Event Dinner** at the Cranfield Management Development Centre (CMDC)*

Thursday 9th May – *" Material Challenges, mechanisms and testing methods"*

09:00-10:00	**High temperature oxidation and water vapour corrosion**	John Nicholls (CU)
10:00-11:00	**High temperature oxidation and water vapour corrosion**	John Nicholls (CU)
11:00-11:15	*Break*	
11:15-12:15	**Experimental techniques for hydrogen quantification**	Brian Connolly (UOM)
12:15-13:15	**Hydrogen safety**	Andrew Rolt (CU
13:15-14:15	*Break*	
14:15-14:45	**Lab activities** (intro, assignment instructions and group study)	FF/FDM/JB
14:45-15:00	*Break*	
15:00-16:00	**Lab activities** (practical hydrogen charging and discharging)	FF/FDM/JB
16:00-17:15	**Lab activities** (Discussion of results)	FF/FDM/JB

17:15-18:00	*Lab visits (Hydrogen testing facilities B57)*

Friday 10th May – *"Enabling Technologies"*

09:00-10:00	**Entry into Service of H_2 Aircraft and Wider Decarbonising**	Pericles Pilidis (CU)
10:00-11:00	**Hydrogen sensors**	Iva Chianella (CU)
11:00-11:15	*Break*	
11:15-12:15	**Modelling hydrogen transport in materials: FESTIM**	Remi Delaporte-Maturin (MIT)
12:15-13:15	**Tritium in Nuclear Fusion**	Stuart Christie (UOM)
13:15-14:15	*Lunch*	
14:15-14:30	**Closing remarks**	Francesco Fanicchia (CU)

List of Contributors:

Dr. Francesco Fanicchia (*course conveyor*) – Senior Lecturer in High Temperature Surface Engineering, Cranfield University, UK

Dr. Louise Gale – Materials Specialist, Central Technology Team, Rolls Royce Plc., UK.

Prof. Pericles Pilidis – Professor of Gas Turbine Performance, Cranfield University, UK.

Dr. Remi Delaporte-Maturin – Postdoctoral Associate, Plasma Science and Fusion Centre, MIT, USA.

Dr. Fabian Duarte Martinez - Postdoctoral Research Fellow, Cranfield University, UK.

Dr. Gustavo Castelluccio – Reader in Mesoscale Mechanics, Cranfield University, UK

Dr. Stefanos Giannis – Science Lead, Advanced Materials, National Physical Laboratories (NPL), UK

Prof. Alan Turnbull – Senior Fellow, National Physical Laboratories (NPL), UK

Dr. Huw Edwards – Hydrogen Cryogenic Specialist, Aerospace Technology Institute (ATI), UK.

Dr. Brian Connolly – Reader in Corrosion Performance, The University of Manchester, UK.

Prof. John Nicholls – Professor of Coatings Technology, Cranfield University, UK.

Dr. Stuart Christie – Lecturer, The University of Manchester, UK.

Dr. Indrat Aria – Senior Lecturer in Functional Nanomaterials, Cranfield University, UK.

Prof. Krzysztof Koziol - Professor of Composites Engineering, Cranfield University, UK.

Prof. Upul Kahagala Gamage, Professor and Interim Director, Energy & Sustainability Theme, School of Water, Energy and Environment.

Charlie Hutchings – Materials Performance Engineer, Frazer-Nash Consultancy, UK

Dr. Andrew Rolt – Senior Research Fellow in Low Emissions Aircraft Propulsion Technologies

Dr. Iva Chianella – Senior Lecturer in Bio Sensors and Functional Polymers, Cranfield University, UK.

Jake Blythe – Research Assistant in Hydrogen Transport, Cranfield University, UK.