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PACIFIC
Providing A nuclear fuel Cycle In the UK For Implementing Carbon reduction

Imperial College London · uclan · University of Leeds · National Nuclear Laboratory · The University of Manchester · Rolls-Royce · University of Cambridge · UCL · University of Bristol · The University Of Sheffield. · Lancaster University · University of Oxford · The University of Edinburgh · EDF Energy · Westinghouse

A collaboration of 12 leading nuclear research universities, the National Nuclear Lab, and major industry partners

Project Overview and Aims

- PACIFIC uniquely combines the research communities in **Nuclear Fuels** and **Nuclear Separations and Recycle** to create a holistic approach to nuclear fuel cycle research.
- Aims to build a sustainable academic consortium in nuclear fuel cycle technology, working directly with industry and international universities, national labs and regulators, to address the key challenges of advanced fuels and recycle technologies.
- Academically excellent research that uses leading analytical modelling methods to inform and guide world-class experimental programmes.
- The research scope covers a range of time-scales, from near-term technologies applicable to current facilities, to longer-term sustainable technologies for advanced Gen-IV systems.
- Will train a cohort of young PhD and post-doctoral researchers in nuclear fuel technology, in order to address the existing and widening skills gap in nuclear fuel cycle technology
- Multi-disciplined collaborative approach, in two key areas – Fuels and Separation technologies
- Potential projects put forward and selected by Peer Review by National Decommissioning Authority, National Nuclear Laboratory, Westinghouse, Rolls-Royce and EDF and guided by the Nuclear Fission Technology Roadmap

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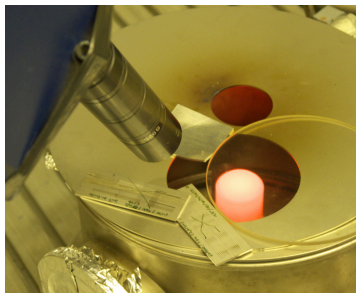
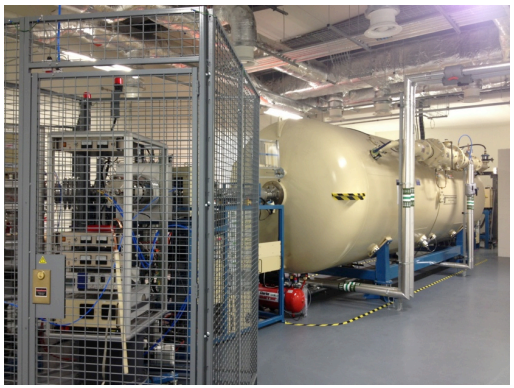
PACIFIC Fuel Projects

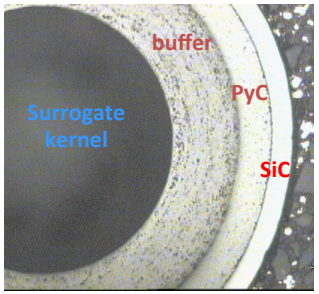
	Project	Lead	Partners
In-Reactor Damage Effects in Advanced Ceramic Fuels and Coatings			
1	**Fuel Modelling**	Robin Grimes	Imperial College, Cambridge Manchester, Westinghouse
2	**Thin Film Sample Manufacture**	Tom Scott	Bristol, Manchester, NNL
3	**Advanced TRISO Coated Particle Fuel**	Ping Xiao	Manchester, NNL
4	**ATF Fuel Manufacture, Characterisation and Irradiation**	Tim Abram	Manchester, Bristol, NNL
In-Reactor Damage Effects in Cladding Materials			
1	**Mechanistic Study of Pellet-Cladding Interaction**	Michael Preuss	Manchester, Imperial College, Westinghouse



NFCE facilities for manufacturing and testing Accident-Tolerant Fuels and Cladding

Irradiation testing at DCF





CVD coater for TRISO fuel particle manufacture

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PACIFIC Separations and Recycle Projects

Research Area	Title of Project	Lead	University
Minor actinide separation	Direct monitoring of speciation in fuel cycle separations	S Faulkner	Oxford
	Optimising Interfacial Transfer Kinetics During Nuclear Separations	C Boxall	Lancaster
	Actinide behaviour and radiolysis effects of complexants in advanced separations	C Sharrad	Manchester
	Actinide Separation and Selective Extraction Technology (ASSET)	L Harwood	Reading
Advanced separations technology	Developing a better understanding of conventional solvent extraction technology	B Hanson	Leeds
	Intensified separation using impinging jets	P Angeli	UCL
	Development of high efficiency coalescers and settlers	B Hanson	Leeds
	Continuous Chromatographic Separation of Actinides and Fission Products	H Eccles	Uclan
Product conversion to fuel	The Conversion of Mixed Fuel Oxides to Fuels and Fuel precursors using Molten Salt systems	A Mount	Edinburgh
	Electro-reduction of spent nuclear fuel oxides for separation and conversion to fuel precursors	D Brett	UCL
	Decontamination and immobilisation of pyroprocessing wastes	N Hyatt	Sheffield

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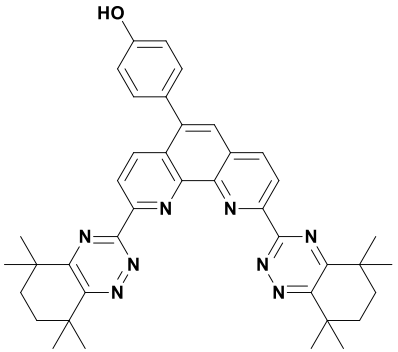
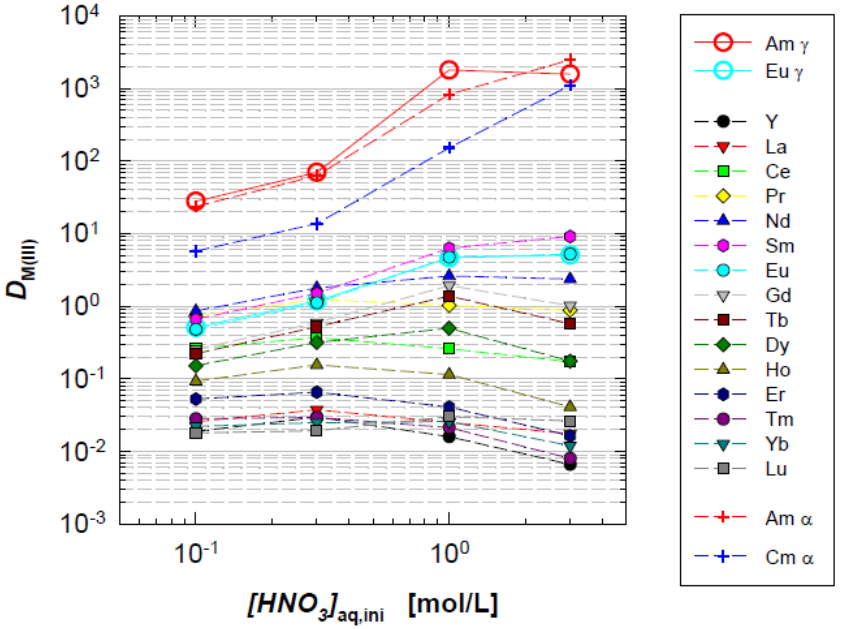
Electronically modulated BTPhens

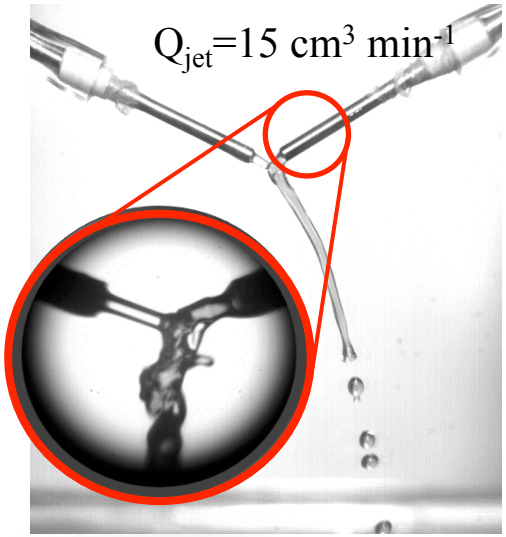


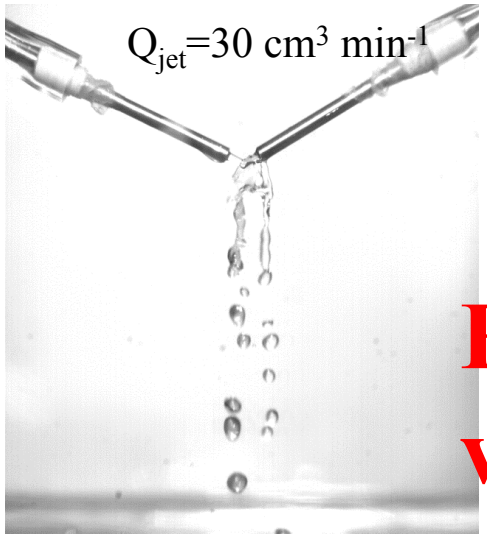
5-(4-hydroxyphenyl)-CyMe4-BTPhen

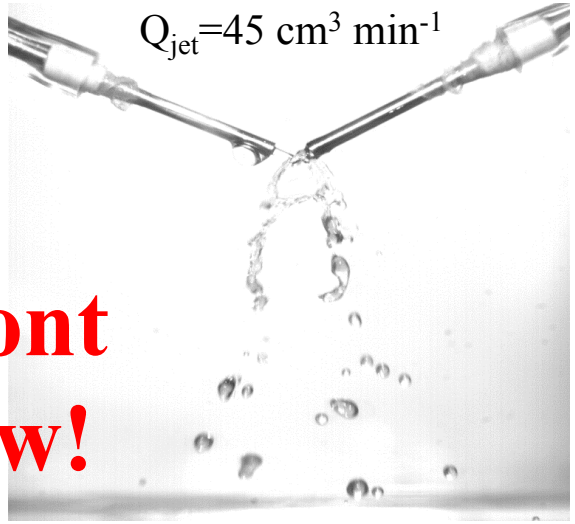
D_{Am} = *ca.* 1581, D_{Eu} = *ca.* 5
$SF_{Am/Eu}$ = *ca.* 320 at 3 M HNO_3



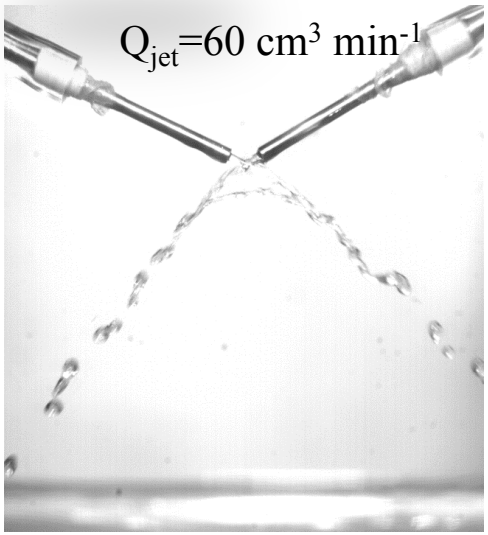
A. Afsar, L. M. Harwood, M. J. Hudson, A. Geist and J. Westwood, *Chem. Commun.*, **2015**, 51, 5860 – 5863.

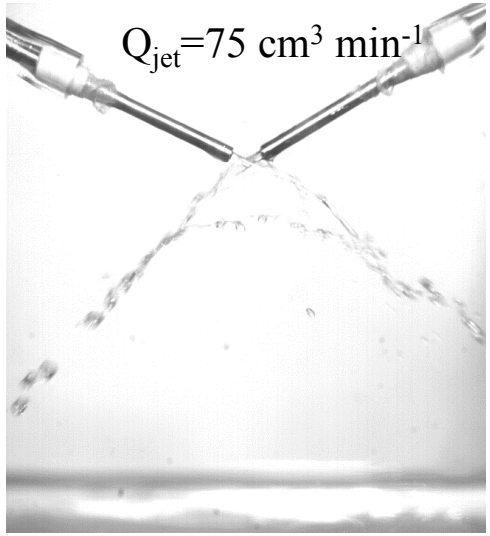






Front view!





- Liquid sheet is formed when the two liquid jets impinge at sufficient momentum.
- The liquid sheet disintegrates to form droplets from waves at the point of impingement

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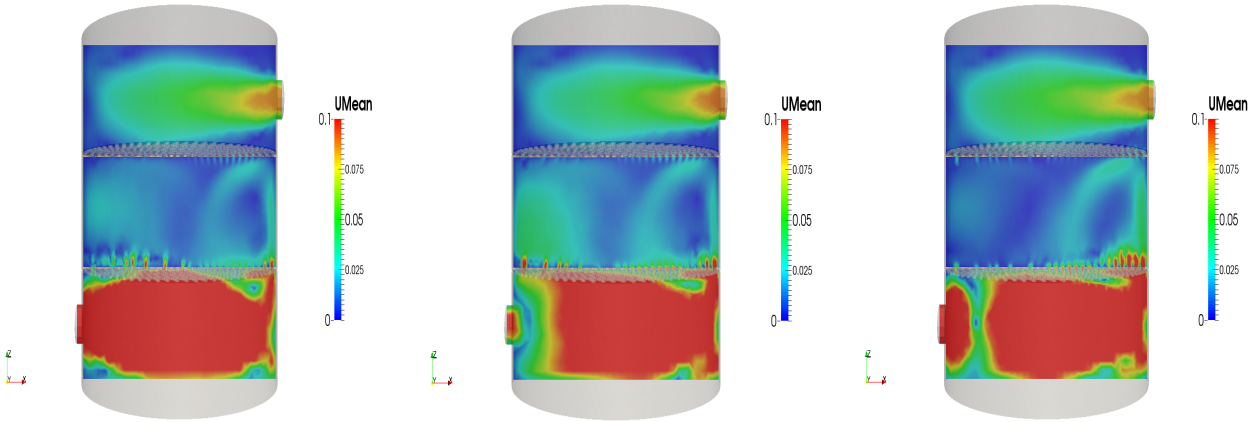
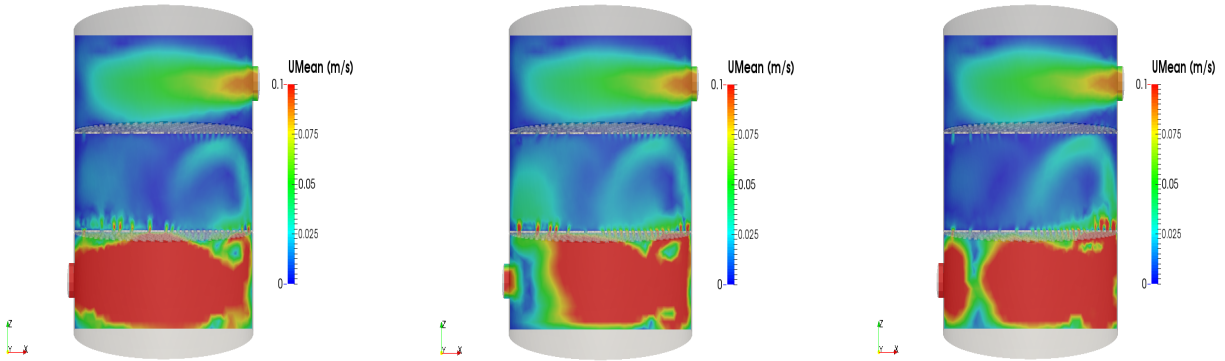
Time Averaged – LES vs k-e

k-e



LES



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Z Khatir, B Hanson, M Fairweather, P Heggs