
**Analytical Division**
**Radiochemistry Group**

# 14th International Symposium on Nuclear and Environmental Radiochemical Analysis

12-15th September 2022
National Railway Museum
York UK

# PROGRAMME

**Sponsored by**


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**ORGANISING COMMITTEE:**

| | |
|---|---|
| Dr M Collins, RSC-Radiochemistry Group Chair | Conference Chair |
| Dr N Evans, Nottingham Trent University | Conference Secretary |
| Dr Richard Marsh, University of Southampton | Conference Treasurer |
| D A Wickenden, Magnox ltd | Conference Logistics |

**TECHNICAL COMMITTEE:**

Professor D Read, University of Surrey

Dr N Evans, Nottingham Trent University

Professor K Morris University of Manchester

**EXHIBITORS:**


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RAdioactive waste Disposal
and Environmental Remediation

**MONDAY 12th SEPTEMBER**

**12:00 – 19:00** **CONFERENCE REGISTRATION**

**National Railway Museum Conference Centre Reception**

**Leeman Road**

**York**

**UK**

**YO26 4XJ**

**The registration desk will be open during the Conference at refreshment breaks and lunchtime. Any delegate concerns outside these times can be brought to the attention of any member of the conference organising committee.**

**19:00 – 23:00** **Conference Ice-Breaker (Wine and Buffet)**

**National Railway Museum**

**Great Hall**

## TUESDAY 13TH SEPTEMBER

**08:45 – 09:00** **Welcome Address – Dr M Collins Conference Committee Chair**

## SESSION 1

## DEVELOPMENTS IN RADIOCHEMICAL ANALYSIS I

**Chairperson – Professor D Read, University of Surrey**

**09:00 – 09:40** **Invited Lecturer:**

**Professor D P Mills. University of Manchester, UK**

**Using Molecular Chemistry to Quantify Lanthanide and Actinide Covalency.**

Abstract 1

**09:40 – 10:00** **Rapid Radiochemical Separations of Americium from Complex Matrices using Custom Extraction Chromatography Resins**

J Mahmoud[1], M Higginson[2], P Thompson[2], C Gilligan[2], F Livens[1], S L Heath[1].

[1]University of Manchester, UK.
[2]AWE, Aldermaston, Reading, RG7 4PR, UK

Abstract 2

**10:00– 10:20** **Measurement of Challenging Medium and Long-lived Radionuclides using Tandem Inductively Coupled Plasma Mass Spectrometry**

B Russell[1], P Warwick[2], H Mohamud[1], H Thompkins[1], F Falksohn[1], S Kolmogorova[1], A Bhaisare[1]

[1]Nuclear Metrology Group National Physical Laboratory, UK
[2]University of Southampton, UK

Abstract 3

**10:20 – 10:40** **Fast and Pseudo-quantitative Analysis of Artificial Radionuclides with Plastic Scintillators for Waste Characterization**

X Mendo[1], E Antoñanzas[1], H Bagán[1]; A Tarancón*[1,2,3]

[1]Departament d'Enginyeria Química I Química Analítica, Universitat de Barcelona, Marti i Franqués, 1-11, ES-08028, Barcelona, Spain.
[2]Serra-Húnter Program, Generalitat de Catalunya, Barcelona Spain.
[3]Institut de Recerca de l'Aigua, Universitat de Barcelona, Montalegre, 6 08001 Barcelona, Spain

Abstract 4

**10:40 – 11:10** **Tea And Coffee** – Duchess of Hamilton Suite

**11:10 – 11:30** **Rapid Prototyping LoCs for the Future: a numerical optimization of bulk optical parameters in microfluidic systems for radionuclide detection**

S E Lu*, G Clinton-Bailey, M Mowlem, P E Warwick

School of Ocean and Earth Sciences, Faculty of Environmental and Life Sciences, University of Southampton, University Rd, Highfield, Southampton SO17 1BJ, UK

Abstract 5

**11:30 – 11:50** **Advances in Low-level Radionuclide Detection using Desolvating Sample Introduction combined with ICP-MS/MS**

F Falksohn*[1], B Russell[1]

National Physical Laboratory Teddington, London, UK

Abstract 6

**11:50 – 12:10** **Radionuclides for Health UK: improving UK access to radionuclides for molecular radiotherapy**

J Young [1,2], M Craft[3], P Blower[1], T Tinsley[4], J Sosabowski [2]

[1]School of Biomedical Engineering and Imaging Sciences, King's College London
[2]Centre for Cancer Biomarkers and Biotherapeutics, Bart's Cancer Institute, Queen Mary University of London
[3]CRUK RadNet City of London Radiation Research Unit, Medical, Physics and Biomedical Engineering, University College London, UK
[4]The National Nuclear Laboratory, Sellafield, UK

Abstract 7

**12:10 – 12:30** **Coincidence and Anti-Coincidence Gamma Ray Spectroscopy in Radionuclide Identification**

S. Landsberger[1]*, C. Egozi[1], W. Charlton, N. Kaitschuck[1], F. J. Martinez[2]

[1]University of Texas at Austin, Nuclear Engineering Teach Lab Pickle Research Campus, Building 159, Austin, Texas, USA, 78712
[2]Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, New Mexico, USA, 87545

Abstract 8

**12:30 – 13:50** **Lunch – National Railway Museum Great Hall**

## SESSION 2 TUESDAY 13TH SEPTEMBER

## ENVIRONMENTAL RADIOCHEMISTRY

**Chairperson – Dr K Baines, IAEA, Vienna**

**13:50 – 14:10** **Determination of Sedimentation Rates in UK Marine Environments using Lead-210 and Complementary Fingerprinting Tools.**

F Dal Molin*, P Blowers, D Brady, N Brown, S Cogan, T Davis, J Franks, M Huk, P Smedley

Cefas, Pakefield Road, Lowestoft, NR33 0HT, UK

Abstract 9

**14:10 – 14:30** **Leaching Behaviour Of Cement With Substitute Clinker Materials In Deionised Water**

A Kozlowski*, J Renshaw, K Dobson

Department of Civil and Environmental Engineering, University of Strathclyde, Level 5, James Weir Building, 75 Montrose St, Glasgow, G1 1XJ

Abstract 10

**14:30 – 14:50** **Corrosion of Nuclear Waste Glass in Complex Natural Environments**

C L Thorpe[1]*, G Manifold[1], R Crawford[1], C Boothman[2], K Morris[2], J R Lloyd[2], R J Hand[2], C L Corkhill[1]

[1]Immobilization Science Laboratory, Department of Materials Science and Engineering, University of Sheffield. Sir Robert Hadfield Building, Mappin Street, Sheffield, S1 3JD.
[2]Research Centre for Radwaste Disposal and Williamson Research Centre, Department of Earth and Environmental Science, University of Manchester, Oxford Road, M13 9QQ.

Abstract 11

**14:50 – 15:30** **Tea And Coffee – Duchess of Hamilton Suite**

**15:30 - 15:50** **Comparative Analysis of Uranium(VI) Reduction by a Sulfate- and an Iron-reducing Bacterium**

S. Hilpmann[1*], Isabelle Jeschke[1], R. Steudtner[1], R. Hübner[2], T. Stumpf[1], A. Cherkouk[1]

[1]Helmholtz-Zentrum Dresden-Rossendorf, Institute of Resource Ecology, Dresden, Germany
[2]Helmholtz-Zentrum Dresden-Rossendorf, Institute of Ion Beam Physics and Materials Research, Dresden, Germany

Abstract 12

**15:50 – 16:10** **Pore Network and Flow Field Analysis towards improved Predictability of Diffusive Transport in Host Rocks for Radioactive Waste**

T Bollermann, Tao Yuan, J Kulenkampff, T Stumpf, C Fischer*

Institute of Resource Ecology, Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Germany.

Abstract 13

**16:10 – 16:30** **Exploring the Fate of U(VI)-incorporated Goethite: impact of environmental perturbations**

Olwen Stagg,[1] Katherine Morris,[1] Liam Abrahamsen-Mills,[2] Luke T. Townsend[3] and Samuel Shaw[1]

[1] Research Centre for Radwaste Disposal and Williamson Research Centre for Molecular Environmental Science, Department of Earth and Environmental Sciences, The University of Manchester, Manchester, M13 9PL, U.K.,
[2] National Nuclear Laboratory, Warrington, Cheshire, WA3 6AE, U.K.,
[3] Department of Materials Science & Engineering, The University of Sheffield, S1 3JD, U.K.

Abstract 14

**16:30 – 16:50** **Approaches to Groundwater Radionuclide Remediation at Sellafield - In situ Phosphate Mineralisation**

C Robinson[1*], S Shaw[1], J R. Lloyd[1], J Graham[2], K Morris[1]

[1]Research Centre for Radwaste Disposal, Department of Earth and Environmental Sciences, University of Manchester, Manchester, M13 9PL, UK.
[2]National Nuclear Laboratory, Chadwick House, Birchwood Park, Warrington, Cheshire, WA3 6AE

Abstract 15

**17:00 - 23:00** **Poster Presentations with Wine and Buffet (from 19:00) National Railway Museum Great Hall**

## SESSION 3 Wednesday 14TH SEPTEMBER

## RADIOACTIVE WASTE MANAGEMENT

**Chairperson – M D Wickenden, Magnox Ltd**

**09:00 – 09:40** **Invited Lecturer:**

**Professor Francis Livens, Dalton Nuclear Institute, University of Manchester**

**The Role of Radiochemistry in the UK's Energy Future**

Abstract 16

**09:40 – 10:00** **The Importance of Radiochemistry and Radiochemists in the Management of Radioactive Waste**

N Smith*,

Division of Nuclear Fuel Cycle, Waste Technology and Research Reactors, International Atomic Energy Agency, Vienna Austria

Abstract 17

**10:00– 10:20** **Impact of Gluconate on the Solubility and Redox Chemistry of Technetium**

S. B. Duckworth[1,*], X. Gaona[1], K. Dardenne[1], J. Rothe[1], R. Polly[1], M. Altmaier[1], H. Geckeis[1]

[1]Institute for Nuclear Waste Disposal (INE), Karlsruhe Institute of Technology (KIT)

Abstract18

**10:20– 10:40** **Colloidal Particulates in Spent Nuclear Fuel Storage: from fundamental properties to effluent treatment**

T S Neill[1]*, C Foster[1,2], S Shaw[1], N Bryan[2], N K Sherriff[2], B Rigby[3], L Natrajan[4], S Kellett[3], K Morris[1]

[1]Research Centre for Radwaste Disposal and Williamson Research Centre, Department of Earth & Environmental Sciences, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK
[2]National Nuclear Laboratory, Chadwick House, Warrington Road, Birchwood Park, Warrington, WA3 6AE, UK
[3]Sellafield Ltd., Hinton House, Birchwood Park Avenue, Risley, Warrington, Cheshire, WA3 6GR, UK
[4]Centre for Radiochemistry Research, Department of Chemistry, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK

Abstract 19

**10:40 – 11:10** **Tea and Coffee**– Duchess of Hamilton Suite

**11:10 – 11:30** **Radiological Characterisation of 850 t Reactor Boilers at Dungeness A Decommissioning Site**

J Weatherill[1]*, D Wickenden[1], D Vernon[1], C Goddard[1], R Wicker[2]

[1]Magnox Ltd, Magnox Hub (Bristol), Almondsbury Business Park, Great Park Rd, Bradley Stoke, BS32 4QQ
[2]Magnox Ltd, Dungeness A, Romney, Kent

Abstract 20

**11:30 – 11:50** **Characterisation of Magnox Reactor Graphite**

Alan Fisher*, R Harris

[1]Magnox Ltd, Magnox Hub (Bristol), Almondsbury Business Park, Great Park Rd, Bradley Stoke, BS32 4QQ

Abstract 21

**11:50 – 12:10** **Characterisation of Materials from the Hunterston A Spent Nuclear Fuel Storage Pond**

A Denman*[1], S Heath[1], G Law[2], N Smith[3], T Carey[3]

[1] Department of Earth and Environmental Sciences, The University of Manchester, M13 9PL, UK
[2] Radiochemistry Unit, Department of Chemistry, The University of Helsinki, 00014, Finland
[3] National Nuclear Laboratory, Chadwick House, Birchwood Park, Warrington, WA3 6AE, UK

Abstract 22

**12:10 – 12:30** **Recrystallisation of Cement Phases; an efficient process for the immobilisation of $^{32}$Si and $^{41}$Ca in cementitious environments**

J Tits*, E Curti, A Laube, E Wieland

Laboratory for Waste Management, Paul Scherrer Institut, CH-5232 Villigen-PSI Switzerland

Abstract 23

**12:30 - 13:50** **Lunch - National Railway Museum Great Hall**

## SESSION 4 Wednesday 14TH SEPTEMBER

## NUCLEAR AND ENVIRONMENTAL FORENSICS

**Chairperson – Dr Clemens Walther, Institute of Radioecology and Radiation Protection (IRS), Leibniz University**

**13:50 – 14:10** **Research Reactor Support for Nuclear Forensics Studies and the Development of a Companion Graduate Course**

S. Landsberger, D. Haas

University of Texas at Austin, Nuclear Engineering Teach Laboratory Pickle Research Campus, Building 159, Austin, Texas, USA, 78712

Abstract 24

**14:10 – 14:30** **Recent analytical developments in radio-chronometric age dating at the Atomic Weapons Establishment (AWE)**

S. Cross, M. Higginson, J. Dunne, C. Gilligan

Atomic Weapons Establishment (AWE), Aldermaston, Reading, RG7 4PR, UK

Abstract 25

**14:30 – 14:50** **Determination of Transuranium Elements Produced by the Castle Bravo Explosion**

J A Corcho-Alvarado*, S Röllin, H Sahli

Nuclear Chemistry Division, Spiez Laboratory, FOCP, Switzerland

Abstract 26

**14:50 – 15:30** **Tea and Coffee**– Duchess of Hamilton Suite

**15:30 – 15:50** **Determination of $^{241}$Pu and $^{242m}$Am- in Global Fallout and Chernobyl Samples by Decay Products Ingrown Method Applied to Old Alpha Sources**

J W.Mietelski*, S Błażej, R Kierepko

Institute of Nuclear Physics, Polish Academy of Sciences, 31-342 Kraków, Radzikowskiego 152, Poland.

Abstract 27

**15:50 – 16:10** **Establishing Discordance as a Radiochronometric Signature for Nuclear Forensics Investigations: a Multi-laboratory Intercomparison Exercise**

M A Higginson[1*], T M Kayzar-Boggs[2], C Y Chen[3], S Cross[1], J S Denton[2], J A Dunne[1] M A Edwards[2], C Eng[3], A M Gaffney[3], C R D Gilligan[1] M N Morris[3], J M Rolison[3], M E Sanborn[2], A M Wende[2]

[1] AWE, AWE Aldermaston, RG7 4PR, UK
[2] LANL, Nuclear and Radiochemistry Group, Chemistry Division, Los Alamos National Laboratory, Los Alamos, NM 87545, USA.
[3] LLNL, Nuclear and Chemical Sciences Division, Lawrence Livermore National Laboratory, 7000 East Avenue, Livermore, CA 94551, USA

Abstract 28

**16:10 – 16:30** **'Hot' Particle Detection with Real-time Autoradiography**

J W L Ang*[1], A Bongrand[2,3], Samuel Duval[2], Jérôme Donnard[2], Risto Koivula[1], Marja Siitari-Kauppi[1], Gareth T. W. Law[1]

[1] Radiochemistry Unit, Department of Chemistry, The University of Helsinki, Helsinki 00014, Finland
[2] AI4R, 2 Alfred Kastler, 44307, Nantes, France
[3] IMT Atlantique, Nantes Université, CNRS, SUBATECH, F-44000 Nantes, France

Abstract 29

**16:30 – 16:50** **Retrospective Determination of $^{236}U/^{238}U$ and $^{240}Pu/^{239}Pu$ Atom Ratios in Aerosols and Lung Ashes from Vienna, Austria**

G Wallner, P Zima, W Moser, H Uguz, P Steier, K Hain

University of Vienna, Reichsratsstraße 4-6 · 1010 Vienna

Abstract 30

**19:00 – 23:00** **Conference Dinner**
**National Railway Museum**
**Station Hall**

**(Smart Casual Dress)**

## SESSION 5 Thursday 15TH SEPTEMBER

## DEVELOPMENTS IN RADIOCHEMICAL ANALYSIS II

**Chairperson – Dr Jan Tits, Paul Scherrer Institut**?

**09:00 – 09:20** **What Single Hot Particles tell us: from Nuclear Forensics to Bioavailability**

C Walther[1], D van Eerten[1], L Leifermann[1], P Hanemann[1], M Raiwa[1], T Weissenborn[1], K Wendt[2]

[1] Institute of Radioecology and Radiation Protection (IRS), Leibniz University Hannover, 30419 Hannover, Germany
[2] Institute of Physics, Johannes Gutenberg-University Mainz, D-55099 Mainz, Germany

Abstract 31

**09:20 – 09:40** **Is it Possible to Measure Sr-90 in Radioactive Waste Without Harmful Chemical Reagents?**

C Gautier*[1], E Baudat[1], H Bagán[2], A Tarancón[2], C Colin[1], E Laporte[1], P Fichet[3]

[1] Université Paris-Saclay, CEA, Service d'Études Analytiques et de Réactivité des Surfaces, 91191, Gif-sur-Yvette, France.
[2] Department of Chemical Engineering and Analytical Chemistry, University of Barcelona, Marti i Franqués, 1-11, ES-08028, Barcelona, Spain.
[3] CEA, DES/DDSD/DFDE/SGOF, Building 611, 91191, Gif-sur-Yvette, France.

Abstract 32

**09:40 – 10:00** **Fast Am, Pu and Sr Separation after Automated Fusion of Highly Dense Barite Concrete**

M Jäggi*, F Köhler, M Heule

Paul Scherrer Institute, Department of Radiation and Safety, Radioanalytics, CH-5232 Villigen, Switzerland

Abstract 33

**10:00 – 10:20** **Influence of Potential Complexing and Decorporation Agents on the Speciation of Radium in the Human Digestive System**

L Holtmann*, A Shamoun, B Riebe, C Walther

Institute of Radioecology and Radiation Protection, Leibniz Universität Hannover, D-30419 Hannover, Germany.

Abstract 34

**10:20 – 10:40** **Radioactive Cosmetics**

P Baranowska, N Evans*

Nottingham Trent University, 50 Shakespeare Street, Nottingham, UK

Abstract 35

**10:40 – 11:00** **Luminescence Spectroscopic Investigations of U(VI) Complexation with Aqueous Silicates at (hyper) Alkaline Conditions**

C Shang[1]*, S B Duckworth[1], A Skerencak-Frech[1], M Altmaier[1], X Gaona[1]

[1] Institute for Nuclear Waste Disposal (INE), Karlsruhe Institute of Technology (KIT), 76344 Eggenstein-Leopoldshafen, Germany

Abstract 36

**11:00 – 11:40** **Tea and Coffee**– Duchess of Hamilton Suite

**11:40 – 12:00** **Accelerator Mass Spectrometry – NNUF Lancaster; an Example of how such a capability can be applied to nuclear site remediation and environmental clean-up**

C Tighe[1], M Castrillejo[2], M Christl[2], C Degueldre[1], J Andrew[3]*, K T Semple[4], M J Joyce[1]

[1] Department of Engineering, Lancaster University, Lancaster, UK.
[2] Laboratory of Ion Beam Physics, ETH - Zürich, Zürich, Switzerland.
[3] Dounreay Site Restoration Ltd., Dounreay, Thurso, Scotland.
[4] Lancaster Environment Centre, Lancaster University, Lancaster, UK.

Abstract 37

**12:00 – 12:20** **Analytical Requirements for the Fusion Fuel Cycle**

L McWilliam,

H3AT, Culham Centre for Fusion Energy, UKAEA, Chilton, Oxfordshire, UK

Abstract 38

**12:20 – 12:40** **Development of Single Particle ICP-MS for Nuclear Applications.**

H Mohamud[1], B Russell[1], E van Es[1], F Falksohn[1], S Ioannidis[1], E Braysher[2]

[1] Nuclear Metrology Group and 2Air Quality and Aerosol Metrology Group, National Physical Laboratory, Hampton Road, Teddington, TW11 0LW

Abstract 39

**12:40** **Closing Remarks – Dr M Collins – Conference Committee Chair**
**Followed by Lunch ("Hot-box")**

**14:00** **CONFERENCE CLOSE**