University of Birmingham

Professor Jamie Lead PhD

Professor of Environmental Nanoscience and Director the Facility of Environmental Nanoscience Analysis and Characterisation

School of Geography, Earth and Environmental Sciences (/schools/gees/index.aspx)

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About

Professor Jamie Lead's research aims to understand nanoscale phenomena in the environment and he is interested in investigating natural nanomaterials, manufactured nanomaterials and their interaction. He is Director of **FENAC (Facility of Environmental Nanoscience Analysis and Characterisation) (/facilities/fenac/index.aspx)** .

Biography

Professor Lead obtained a BSc in Environmental Science in the School of Chemical and Molecular Sciences at the University of Sussex in 1990. After a year out of academia, he moved to Lancaster University where he completed a PhD on the role of humic substances in the chemistry of lanthanides and actinides in freshwaters and soils in 1994. He has undertaken postdoctoral work in the area of aquatic chemistry in the UK, Europe and Australia. He began his present appointment at the University of Birmingham as a lecturer in January 2000; in 2004 became a senior lecturer and in 2006 a Reader in Aquatic Chemistry. In 2006-07, he was an invited visiting scientist at the CSIRO, Sydney, Australia. He was granted a personal chair, as Professor of Environmental Nanoscience, in 2008. Professor Lead is a Fellow of the Royal Society of Chemistry, the International Union of Pure and Applied Chemistry and the Institute of Nanotechnology. He is a member of several committees and advisory boards both nationally and internationally and is editor of the journal Environmental Chemsitry.

Teaching

Course Leader MRes Human and Environemntal Impacts of Nanoscience and Nanotechnology

Postgraduate supervision

Research Students

Ashwini Prasad, Quantifying particle number and surface are concentration of manufactured nanoparticles in complex media (2011-2014)

Gofetamang Ditalelo, Dissolved Co and Co nanoparticle effects on bacteria in sewage treatment systems (2010-2013).

N. Alexa, Development of in-situ sensor to probe trace element speciation and bioavailability. (2005-2008)

M. Amezcua; The influence on heavy metal speciation in soils of the fungal bioremediation of phenanthrene (2000 - 2003)

S. Batchelli, Colloid characterisation in estuarine systems (2007-2010)

M-F Belinga. PhD, Ag and carbon-based nanoparticle solid-solution partitioning in sewage treatment systems (2010-2013)

M. Casado, PhD, Ecotoxicology of manufactured nanoparticles (2006-2008)

E. Cieslak, Influence of hydration on colloid and nanoparticle structure and metal binding (2005 - 2009)

J. Climent, Biofilm interactions with metals and nanoparticles (2006-2008)

P. Cole, PhD. Manufactured nanoparticles; characterisation and plant uptake (2007-2010)

S. Cumberland. Engineered nanoparticles interactions with trace metals (2006-2009)

A. De Momi. Understanding the colloid-particle split in aquatic systems (2003-2007)

S. Elliott; Fluorescence signatures in natural aquatic systems (2006)

L-J Ellis. PhD, Ag and carbon-based nanoparticle solid-solution partitioning in freshwaters (2010 – 2013)

C. Gaebel, Virus-colloid nanoscale interactions (2004-2007)

A. Hartland, PhDColloid and stable isotopes in the environment (2007-2010).

A. Hitchman, PhD. Manufactured nanoparticles in the hyporheic zone (2007-2010)

I. Mahapatra, Understanding next generation nanoparticles (2010-2013)

A. Maniculea. Visiting PhD student, Interaction between natural and manufactured nanoparticles in aquatic systems. (2004-2006)

D. Muirhead; Characterisation of aquatic nanoparticles and colloids by atomic force microscopy (2000-2006)

H. Rahman. Virus-colloid interactions in groundwater. (2003-2006)

G. Raza. Quantification of titanium dioxide nanoparticles in the ambient environment (2010-2013)

P. Redwood. Applications of environmental scanning electron microscopy to natural colloids and particles (2001 -2005)

I. Romer. Synthesis and characterisation of silver nanoparticles (2009-2012)

S. Rouen, CASE PhD. Biodiversity and chemistry of contaminated mine waters (2005-2008). EPSRC/EA sponsored. (2005-2012)

B. Seredynska-Sobecka, (2006 - 2008), Colloid-particle separations by SPLITT (2005-2006)

M. Tejamaya. Synthesis and characterisation of silver nanoparticles (2009-2012) Self funded

Research

Research Interests include:

- Understanding the relationship between physical and chemical properties of nanomaterials and their effects on environmental and human health
- Understanding how nanomaterials behave in the environment, linking chemistry, transport and bioavailability
- Characterisation of the structure and properties of environmental aquatic/terrestrial colloids and nanoparticles
- Quantifying the interactions between manufactured nanomaterials and natural colloids and nanoparticles
- Chemical speciation, particularly trace metals in polluted and pristine aquatic, soil and sediment systems
- The development and optimisation of novel analytical and sampling procedures

Current Research:

Bioavailability and Effects in the Environment of manufactured nanomaterials (nanoBEE). (NERC, USEPA, EPSRC, DEFRA, Environment Agency funded, 2010-2014)

From Airborne exposure to BiologicaL Effects (FABLE): pathways for health impacts of nano-particles (NERC/MRC funded, 2011-2015)

Modelling nanoparticle toxicity: principles, methods, novel approaches (EU funded, 2011-2014)

Reference materials for managing the risk of engineered nanoparticles (EU finded, 2011-2015)

Is oxidative stress the principal mode of toxicity for metal oxide nanoparticles? (NERC funded, 2010-2013)

Quantifying particle number and specific surface area of manufactured nanoparticles NERC funded, 2010-2013)

Quantifying baseline concentrations of titania manufactured nanoparticles in natural aquatic system (NERC funded, 2010-2013)

Development of in-situ sensors for direct quantification of metal speciation and bioavailability. (NERC, Technology Proof of Concept Directed Call)

Nanomaterials and REACH – evaluation of applicability of existing procedures for chemical safety assessment of nanomaterials (Environment Agency funded)

Facility for the characterisation of manufactured nanoparticles in the environment. (NERC Service and Facilities, 2009-2012)

Quantifying the structure of very small (<25 nm) natural aquatic colloids (NERC standard grant, 2009-2012)

Quantifying the physico-chemical characteristics of cerium oxide nanoparticles; a preliminary for ecotoxicological investigations. (NERC small grant, 2009-2010)

Elemental signals in karst: from soil to speleothem. (NERC small grant, 2009-2010)

Identifying toxicological effects of engineered nanoparticles on freshwater algae using a metabolomics approach.

NERC NBAF Facility project

Fluid dynamics across the interface of river beds (NERC funded, 2007-2011)

Understanding the environmental behaviour and biological impacts of manufactured nanoparticles in natural aquatic systems (NERC funded, 2006-2009)

Trace metal interactions with natural aquatic nanoparticles (NERC funded, 2002-2008)

Nanoscale colloid-virus interactions (EU funded, 2004-2007)

Development of SPLITT for the fractionation of natural aquatic colloids and particles (EU funded, 2004-2007)

Migration of enteric viruses in deep aquifers (NERC funded, 2002-2006)

Trace element interactions with aquatic colloids and particles (NERC funded, 2002-2005)

Trace metal interactions with manufactured nanoparticles (NERC funded, 2006-2009)

Development of an in-situ sensor for the determination of trace element speciation and bioavailability (EU funded, 2004-2007)

Biofilm-trace metal interactions (EU funded, 2006-2008)

Impacts of wetting and drying on the structure of atmospheric and engineered nanoparticles (EU funded, 2006-2008)

Network on natural aquatic colloids (AQUANET) (NERC funded, 2004-2007)

Network on fluorescence for the water sciences (FLUORONET) (NERC funded, 2005-2008)

Network on Manufactured Nanoparticles in natural waters (NANONET) (NERC funded 2007-2010).

Fluid dynamics across the interface in gravel-bed rivers; quantification and numerical modelling of flow in the hyporheic zone; trace element and nanoparticle transport (NERC funded, 2007-2010)

Understanding the fate and behaviour of manufactured nanoparticles in natural waters (NERC funded. ENI directed programme, 2006-2007)

Manufactured nanoparticle biouptake and bioaccumulation (NERC E&HH programme, 2006-2008)

Publications

Key publications

See a **full list of selected publications (PDF - 97KB) (/Documents/college-les/gees/staff/lead-publications.pdf)**

1. S. Handley-Sidhu, J.C. Renshaw, S. Moriyama, B. Stolpe, P. Yong, C. Mennan, S. Bagheriasl, A. Stamboulis, M. Paterson-Beedle, K. Sasaki, R.A.D. Pattrick, **J.R. Lead**, L. E. Macaskie (2011). Removal of Sr2+ and Co2+ into Biogenic Hydroxyapatite: Implications for Biomineral Ion Exchange Synthesis. Environmental Science and Technology (in press).
2. L. P. C. Romão, C. S. Cerqueira, L. E Fraga, M. L Simões, P. Hammer, J. R Lead, A. P Mangoni, A. S Mangrich (2011). Spectroscopic characterization of reduction and removal of chromium (VI) by tropical peat and humin, Fuel (in press)
3. M.A. Baalousha, B. Stolpe, **J. R. Lead** (2010). Flow field-flow fractionation for the analysis and characterization of natural colloids and manufactured nanoparticles: critical review. Journal of Chromatography, 27, 4078-4103
4. J. Fabrega, R. Zhang, J. Renshaw, W-T Liu **J.R. Lead** (2010). Impact of silver nanoparticles on natural marine biofilms Chemosphere (in press).
5. B. K. Gaiser, T. F. Fernandes, M. A. Jepson, **J. R. Lead**, C. R. Tyler, M.A. Baalousha, A. Biswas, G. Britton, P. A. Cole, B. D. Johnston, Y. Ju-Nam, P. Rosenkranz, T. M. Scown, V. Stone (2010). Interspecies comparisons on the uptake and toxicity of silver and cerium dioxide nanoparticles. Environmental Toxicology and Chemistry, 13, 1227-1235.
6. I. Römer, T. A. White, M.A. Baalousha, K. Chipman, M. R. Viant, J. R. Lead (2010). Aggregation and dispersion of silver nanoparticles in Daphnia magna toxicology exposure media. Journal of Chromatography, 1218, 4226-4233.
7. B. K. Gaiser, A. Biswas , P. Rosenkranz, M. A. Jepson, J. R. Lead, V. Stone, C. R. Tyler, T. F. Fernandes (2011). Effects of silver and cerium dioxide micro- and nano-sized particles on *Daphnia magna.* Journal of Environmental Monitoring, 13, 1227-1235.
8. E. J. Gubbins, L.C. Batty, J. R. Lead (2010). Phytotoxicity of silver nanoparticles to Lemna Minor L. Environmental Pollution, 159, 1511-1519
9. J. Fabrega, S. N. Luoma, C. R. Tyler, T. S. Galloway and J. R. Lead (2010). Silver nanoparticles and their behaviour and effects in natural waters. Environment International, 37, 517-531.
10. A. Hartland, I.J. Fairchild, **J.R. Lead**, A. Baker (2010). Fluorescent properties of organic carbon in cave dripwaters: effects of filtration, temperature and pH. The Science of the Total Environment, 408, 5940-5950.
11. E. Kadar, F. Simmance, O. Martin, N. Voulvoulis, S. Widdicombe, S. Mitov, **J. R. Lead** and J. W. Readman (2010). The influence of engineered Fe2O3 nanoparticles and soluble (FeCl3) iron on the development toxicity caused by CO2-induced seawater acidification, Environmental Pollution, 158, 3490-3497.

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