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Research Opportunities at the School of Chemistry

Our School has four core research themes:

- **Sustainable Synthesis and Catalysis**
- **Chemical Biology**
- **Materials and Interfaces**
- **Analytical Chemistry**

Take a look through the work of the different research groups within each theme. If you are interested in applying for a PhD position, then contact the PI for help with your application!

Sustainable Synthesis and Catalysis

Catalytic Upgrading of Biorenewables

Prof. Steve Bull – sdb45@leicester.ac.uk

- Catalytic transformations
- Biocatalysis
- Flow chemistry
- Biorenewable feedstocks

Synthetic and Catalytic Applications of Earth Abundant Metals

Dr. Fabrizio Ortu – Fabrizio.ortu@leicester.ac.uk

- Earth abundant elements in synthesis and catalysis
- Small molecule activation for sustainable synthesis
- f-Block chemistry and molecular magnetism

Novel Synthetic Methodology

Dr. Alex Pulis – a.pulis@leicester.ac.uk

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Single Atom Catalysts for Fine Chemical Synthesis

Dr. Qun Cao – qc52@leicester.ac.uk

- *Development of Novel Material Synthetic Strategies:* Explore innovative approaches for the synthesis of transition metal-based heterogeneous catalysts.
- *Creation of Electro/Photocatalytic Cross-Coupling Strategies*: Develop entirely new electrochemical and photocatalytic methods for C-C and C-N bond cross-coupling as proof-of-concept demonstrations, application to pharmecetical synthsise (training e.g., GC, GC-MS, NMR, XRD).
- *Advanced Characterization and Mechanistic Studies:* Characterize heterogeneous catalysts and conduct mechanistic investigations using advanced characterization techniques such as STEM, SEM, XPS, operando XAS, and synchrotron-based MѴðssbauer spectroscopy.

Bioinspired Catalytic Small Molecule Activation

Dr. Sandy Kilpatrick – sandy.kilpatrick@leicester.ac.uk

Novel Methodology for Fluorination of Organic Small Molecules

Dr. Alison Stuart – alison.stuart@leicester.ac.uk

- Developing novel synthetic methodology for the fluorination of organic molecules
- Performing mechanistic studies to understand and control our reactions
- Designing new hypervalent iodine reagents
- Investigating new strategies for enantioselective fluorination

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Value-added Products via Smart Catalyst Design

Dr. Greg Solan – gas8@leicester.ac.uk

- Next generation catalysts based on earth abundant transition metals
- Unlock the potential of functional ligands to enhance catalyst performance
- Apply methodology to industry-specific targets
- Address key sustainable challenges (*e.g.*, convert CO_2 to biofuels)

Chemical Biology

Natural and Artificial Metalloenzymes for Energy Conversion

Dr. Patricia Rodriguez-Macia – prm28@leicester.ac.uk

- Mechanistic investigation of natural metalloenzymes for energy conversion, i.e. hydrogenases (H_2 oxidation and production) and CO dehydrogenases (reversible CO_2-to-CO conversion), via a combination of spectroscopic, electrochemical, computational and structural methods
- Mechanistically-driven design of novel artificial metalloenzymes for green chemistry (i.e., H_2 production, CO_2 reduction and oxidation reactions) based on natural protein scaffolds
- Bioinspired *de novo* designed protein as scaffolds for novel artificial metalloenzymes for green chemistry

Metallopharmaceuticals

Dr. Rama Suntharalingam – k.suntharalingam@leicester.ac.uk

- The development of metal-based anti-cancer stem cell agents
- Polymeric nanoparticles for drug delivery
- Probing cell death pathways in cancer cells
- Anti-osteosarcoma small molecules with immunogenic potential

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Heterobifunctional Molecules and Chemical Probes

Dr. James Hodgkinson – jthodgkinson@leicester.ac.uk

- The synthesis and biological evaluation of proteolysis targeting chimeras (PROTACs) for the targeted degradation of individual HDAC corepressor complexes
- The synthesis of novel proximity-inducing heterobifunctional molecules and their mechanism of action studies
- The synthesis and biological evaluation of novel Antibody-Drug Conjugates (ADCs)

The Chemical Biology of Formaldehyde

Dr. Richard Hopkinson – richard.hopkinson@leicester.ac.uk

Molecular Glues and Cooperativity in Drug Development

Dr. Richard Doveston – r.g.doveston@leicester.ac.uk

- Molecular glues for 14-3-3 protein-protein interactions
- Dual ligand cooperativity for targeting Pin1 in cancer
- Fragment based development of inhibitors for PYCR1 in cancer
- Covalent protein modification strategies

Fluorescent Chemical Probes

Prof. Steve Bull – sdb45@leicester.ac.uk

- Fluorescent probes
- Antibody-drug conjugates
- Cell imaging
- Antimicrobials
- Cancer drugs

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Ultrafast Spectroscopy and Mechanism of Metalloenzymes and Materials for Energy Conversion

Dr. Phil Ash – philip.ash@leicester.ac.uk

Frontier Technologies in Spectroscopy, Imaging, Photonics and Microfluidics for Solving Problems at the Life Science Interface

Prof. Andrew Hudson – ah242@leicester.ac.uk

Materials and Interfaces

Electrochemistry for Real-World Applications and Environmental Monitoring

Dr. Jake Yang – my216@leicester.ac.uk

Electrochemical Deposition and Dissolution Processes; Surface and Interfacial Structure

Prof. Karl Ryder – ksr7@leicester.ac.uk

Interfacial Analysis and Imaging

Prof. Rob Hillman – arh7@leicester.ac.uk

- Electroactive polymer, metal and metal oxide films
- Physical characterisation (spectroscopic, acoustic, X-ray, neutron) of electroactive films
- Interfacial design for sensing and energy storage
- Latent fingerprint visualisation in forensic science applications

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Analytical Chemistry

Molecularly Imprinted Polymers for Biosensing and Theranostics

Prof. Sergey Piletsky – sp523@leicester.ac.uk

Nanotechnology and Spectroscopy based on Superfluid Helium

Dr. Shengfu Yang – sfy1@leicester.ac.uk

Laser Spectroscopy and Mass Spectrometry of Molecules, Ions and Clusters in Helium Nanodroplets

Prof. Andrew Ellis – andrew.ellis@leicester.ac.uk

- Exploring superfluid and supersolid effects in helium-tagged molecular ions
- Using molecule-molecule clusters and complexes using laser spectroscopy in helium nanodroplets to investigate intermolecular forces
- Using helium nanodroplets to develop spectroscopic signatures of molecules and molecular ions in space
- Understanding ion-molecule chemistry relevant to astrochemistry using helium droplets and mass spectrometry

Atmospheric Chemistry, Earth Observation Science and Medical Diagnostics

Prof. Paul Monks – p.s.monks@leicester.ac.uk

Novel Functional Materials and Nanomaterials

Dr. Elena Piletska – ep219@leicester.ac.uk