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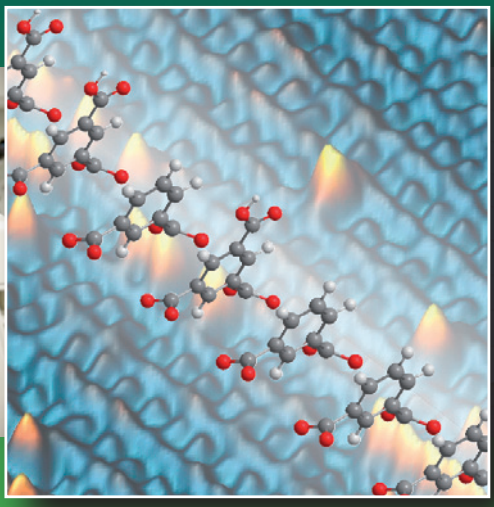
1413 – 2013

Chemistry

Postgraduate Study 2012 Entry



Chemistry

Features

- The School of Chemistry has about 40 full-time academic staff, 14 technical staff, a student population of around 230 full-time equivalents, with over 130 postgraduates and over 60 post-doctoral researchers.
- The University of St Andrews overall, and the School of Chemistry, in particular, have been placed in the top six UK universities, according to *The Times* newspaper over the past two years.
- In the latest Research Assessment Exercise (RAE 2008), the School of Chemistry, as part of the joint Chemistry Research School of Edinburgh and St Andrews (EaStCHEM), achieved an outstanding result. With 75 per cent of all world leading outputs in Scotland and 12 per cent of world leading outputs in all of the UK, EaStCHEM is placed fourth for the quality of chemistry research in the UK and first in the so-called 'power rating' (quality x volume).

Note: All prospective newcomers to the School are urged to establish contact as soon as possible, especially where a position with a specific supervisor is sought. Competition for postgraduate places has been extremely buoyant of late and some positions are filled early in the academic year. The School typically has around 40 grants for fully-funded postgraduate studentships to start in any given year.

Postgraduate Community

Our size promotes a friendly atmosphere with a cross-flow of ideas while providing the depth and breadth necessary to pursue major scientific programmes at an international level. Around 200 publications are produced per year and there are very strong connections with industry across a range of research areas. We are particularly proud of our strong interdisciplinary links with materials, physics and biomolecular sciences. These collaborations often take place through interdisciplinary research centres such as the Centre for Advanced Materials, the Centre for Biomolecular Sciences and the Organic Semiconductor Centre. There is an active student-based Chemical Society which hosts guest speakers and organises social events throughout the year.

"I studied for a BSc in Chemistry with German before starting a PhD in inorganic chemistry. The School offers great opportunities to do cutting edge research into a wide variety of topics and provides a friendly working environment, with a good support network and modules to enhance your learning."

JACQUI
Nuneaton, Warwickshire
Current PhD Chemistry student

Postgraduate Research Opportunities

This information will be of interest to chemists, physicists, biochemists as well as molecular and materials scientists if you have obtained, or expect to obtain, Bachelors or Masters degrees and wish to pursue postgraduate research. Further details of the School's research activities, specifically the interests of individual staff members listed on pages 8-11, are available on request. Information on Masters courses is available on request. Further details are also available on our web pages www.st-andrews.ac.uk/chemistry

Chemical research has a long and distinguished history at St Andrews. Chemistry has been taught as a subject since 1811 and the first Professorship in Chemistry was established in 1840. Nobel prize winners Sir Robert Robinson and Sir Norman Haworth carried out their most important research at St Andrews. The School is rated excellent for its teaching quality and its world-class breadth and depth is documented by the last RAE where the joint research school (EaStCHEM, i.e. Edinburgh and St Andrews Chemistry) demonstrated an outstanding performance. Edinburgh and St Andrews are both leading Schools with complementary areas of expertise, publications and a similar level of research income (~£12M per year each over the past three years). Our aim is to compete with Chemistry centres of excellence anywhere in the world, not only with our research but also through our joint training activities.

The advent of EaStCHEM further enhances our research strength with students from St Andrews having equal access to all of the very specialised equipment / techniques being developed at Edinburgh (and vice versa for Edinburgh students).

The Purdie Building and the adjoining Biomolecular Sciences building and the brand-new Biomedical Sciences Research complex offer excellent accommodation and facilities for teaching and research in some of the most modern and well-equipped laboratories in the UK. In addition, SASOL, the South African based fuels and chemicals giant, has set up its European laboratory in catalysis research here.

The School is equipped to a standard which is recognised internationally as making it one of the world's top-grade research institutions. We support major facilities across the full spectrum of Chemistry, including NMR (both solution and solid-state), X-ray crystallography (single-crystal, powder and macromolecular), electron microscopy, catalyst evaluation, analytical chemistry, spectroscopy and surface science, together with all the standard chemical evaluation techniques.

The School of Chemistry also houses its own library containing all of the major books required for postgraduate research work. Comprehensive online access to journals and national and international databases is available.

Research Areas

The key areas of research within the School can be classified as follows:

- Molecular Synthetic and Structural Chemistry
- Materials Chemistry
- Chemical Biology
- Surface Science
- Theoretical Chemical Physics

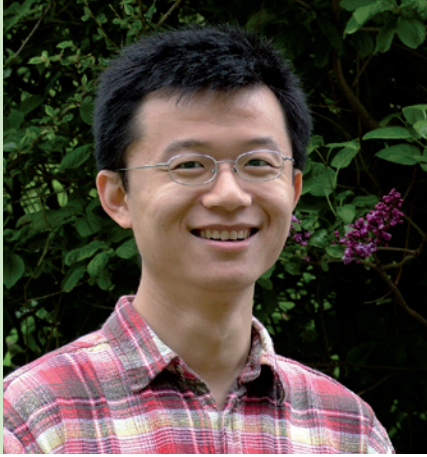
The School has several groups carrying out research in core areas of organic synthesis and molecular inorganic chemistry. This includes diversity orientated synthesis, natural product chemistry, asymmetric synthesis, inorganic and organic heterocycles, sulfur and phosphorus chemistry. We are a leading centre in the area of catalysis. Homogeneous work includes asymmetric catalysis, carbonylation and oxidation reaction, together with novel dendrimer systems. Heterogeneous catalysis includes synthesis and characterisation of zeolites and other solid-acid catalysts and sorbents, preparation and study of supported metal catalysts for automotive and fuel cell applications, and also surface and interface studies.

Molecular Synthetic and Structural Chemistry includes both powder, single crystal and macromolecular X-ray diffraction, and covers areas of structure-property relations within a diverse range of chemical systems, together with studies in crystal engineering and supramolecular chemistry.

In **Materials Chemistry** we have considerable strength in battery and fuel cell technology, solid state electrochemistry, microporous materials, conducting polymers and ceramic oxides for electronic, magnetic and optical applications. These fields are backed up by ongoing theoretical and modelling studies as well as developments in techniques such as X-ray diffraction and solid state NMR.

"During my undergraduate study I built up a strong interest in physical and surface chemistry. After completing my MChem degree in University of Leeds, I chose to do my PhD here in St Andrews because of its world-leading research work in surface chemistry. Every one of the academic and technical staff in the School has been very friendly and helpful. Also, after a week's work, it is always nice to enjoy some time with friends on a golf course or cycling along the beautiful coastline."

ZHE
China
Current PhD Chemistry student



In **Chemical Biology**, we have particular strength in the areas of bioactive molecule synthesis, organofluorine chemistry, the elucidation of enzyme mechanism and protein interactions, protein structure determination, drug design and synthesis and combinatorial methods of organic synthesis.

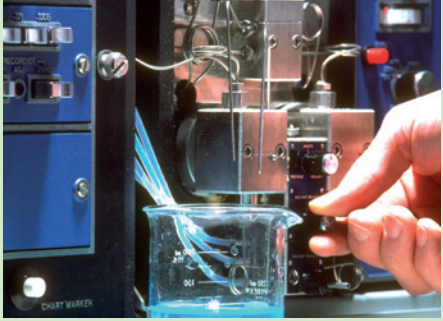
Surface Science involves the characterisation of surfaces and interfaces at the atomic/molecular level and focuses on heterogeneous catalysis including enantioselective reactions, functionalisation and patterning of surfaces as well as two-dimensional nanostructures using concepts based on molecular self-assembly, supramolecular chemistry and electrochemistry.

Theoretical Chemical Physics covers a diversity of areas in computational chemistry including the development of methods and calculations of spectroscopic properties of materials, properties of biological molecules as well as catalytic reactions.

Postgraduate Degree Structure

PhD and MPhil degrees are obtained by research on an agreed project of appropriate originality carried out under the supervision of a chosen member of staff. The emphasis here is on individual instruction and training for independent investigation. You are required to sustain interest in fields outside your particular research areas by attending lectures on advanced topics within the School or in other Schools in the University throughout the academic year, and will also be required to present seminars on your own research at regular intervals. You will also submit reports on your research according to an established timetable. The report at the end of the first year, together with an oral examination, is used as an assessment to recommend continuation of the PhD programme.

You may elect to study for either a PhD or an MPhil degree. Both require the submission and oral examination of a thesis reporting the results of original work. A minimum of twelve months' full-time research is required for the MPhil qualification. The usual period for a PhD degree is now three and half years, and almost all our studentship grants provide full funding for that period. In certain circumstances these degrees can be obtained by part-time study. If you wish to obtain further details of the academic requirements and regulations, or have a query about your present qualifications you should email the Chemistry Postgraduate Admissions Officer who will deal with your question on a personal basis (details on back cover).



Career Opportunities

Recent Chemistry PhD graduates have gone on to successful careers in the chemical industry with companies such as BP, Shell, Johnson Matthey, Siemens and the pharmaceutical industry e.g. GSK, Pfizer, Astra Zeneca. Many also continue in academic life, in universities or research institutions in the UK, Europe, North America, Japan and others worldwide. Other career routes outwith a research environment include scientific publishing, patent law, forensic science, and IT and energy consultancy.

GRADskills – enhancing researchers' skills and employability

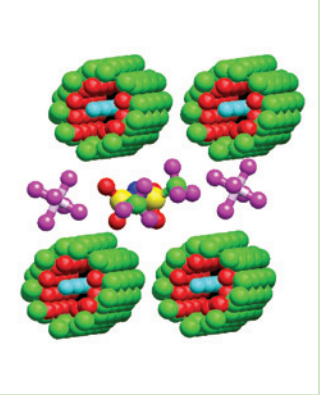
PhD and MPhil research students at St Andrews have access to GRADskills, an extensive and award-winning generic skills development programme for early stage researchers. Further details of the GRADskills programme are available at: www.st-andrews.ac.uk/gradskills

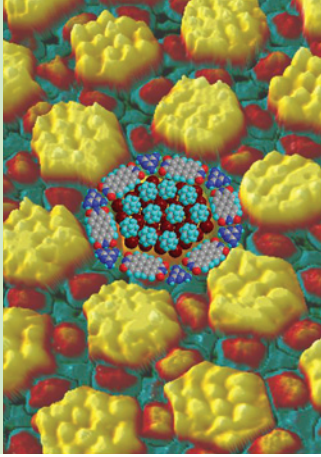
Admissions Requirements

Generally speaking, any person with a good undergraduate degree in Chemistry or a related Science subject (at least 2.1 BSc (Hons) or a GPA of 3.6 or better on a 4 point scale) from a recognised university may be admitted to the School of Chemistry as a postgraduate. Those with qualifications equivalent to a degree are also invited to apply for admission. Enquiries are also welcomed if you have spent some time in industry and would now like to resume your university education. Applicants with BSc 2.2 Honours degrees may become eligible to study for a PhD on completion of an MPhil (research) degree. A requirement for completion of PhD study is to write and present research results in English. Students whose first language is not English who can demonstrate a high level of spoken English at interview (and in written correspondence) will not be required to present qualifications. In other cases, students should obtain and present qualifications from TOEFL or IELTS. For further details about language requrements see: www.st-andrews.ac.uk/elt/entry

Application Process

Further information and an online application form can be found on the Postgraduate Recruitment web pages (contact details on the back of this leaflet). Please also consult the School of Chemistry web pages for more detailed information.
www.st-andrews.ac.uk/chemistry/prospective/pg





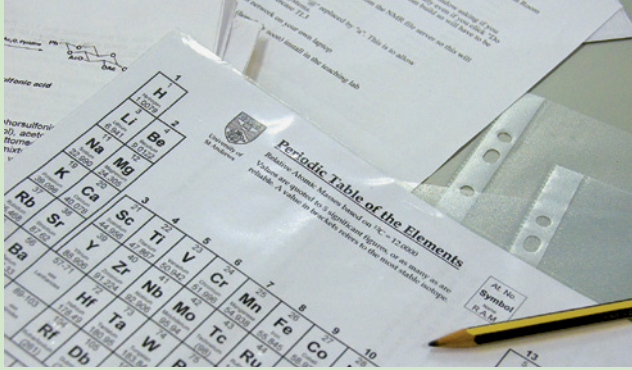
Financial Support

Financial support can be provided in several ways. The majority of the PhD studentships are funded by either project-specific research grants, or by the School's doctoral training grant. The School also generally offers a number of PhD studentships funded by, and in collaboration with, the UK chemical industries. Graduates of Scottish universities may also apply for prestigious Carnegie Scholarships. There are also a number of awards specifically for research in chemistry made possible by generous endowments and the School's own funds.

Some of these awards are earmarked for British and EU students who are resident in the UK. Many are open to any EU subject. There are a limited number of awards that can partially support students from overseas by providing a grant to cover either living expenses or the overseas fees. Due to the nature of overseas fees, there are very few awards that can provide a full scholarship of both fees and living expenses.

An award will normally consist of fees and maintenance. The awards pay fees at the EU rate for students, and provide a stipend that is around £13,500 per year and will rise with inflation. Students may supplement their awards as demonstrators in the departmental laboratories. Apart from receiving remuneration, this is considered a valuable part of the PhD training.

St Andrews has various scholarship opportunities for prospective St Andrews postgraduate students. Our 'Recent Graduate Discount' is designed to recognise the loyalty of current St Andrews students and very recent St Andrews alumni when they apply for postgraduate courses here. Details of all our scholarship opportunities and initiatives can be found on our web page. www.st-andrews.ac.uk/scholarships



Staff Areas of Current Research Activity

Dr R A Aitken (raa@st-andrews.ac.uk) – *Synthetic Organic Chemistry*
Keywords: Synthetic chemistry, Asymmetric synthesis, Flash vacuum pyrolysis, Heterocyclic chemistry, Organophosphorus chemistry, Main group chemistry.

Dr S E Ashbrook (sema@st-andrews.ac.uk) – *Solid State NMR*
Keywords: Solid state NMR methodology, Inorganic materials, Minerals, Microporous solids, High-pressure phases, Ceramics, Ab-initio calculations.

Dr C J Baddeley (cjb14@st-andrews.ac.uk) – *Surface Chemistry*
Keywords: Heterogeneous catalysis, Bimetallic surfaces, Chiral surfaces, Nanoparticle chemistry, Liquid-solid interface.

Dr R T Baker (rtb5@st-andrews.ac.uk) – *Materials Science*
Keywords: High resolution transmission electron microscopy, Fuel cells, Heterogeneous catalysts, Electro-active polymers.

Dr C H Botting (cb2@st-andrews.ac.uk) – *Mass Spectrometry*
Keywords: Protein Mass Spectrometry, Proteomics.

Professor P G Bruce (pgb1@st-andrews.ac.uk) – *Solid State Chemistry and Electrochemistry*
Keywords: Unusual intercalation compounds, Synthesis and characterisation of new transition metal oxides as electrodes for lithium batteries.

Dr M Buck (mb45@st-andrews.ac.uk) – *Physics and Chemistry at Interfaces*
Keywords: Molecular self-assembly at interfaces, Electrochemical nanotechnology, Non-linear optical spectroscopy, Scanning tunnelling microscopy.

Professor M Bühl (mb105@st-andrews.ac.uk) – *Computational Chemistry*
Keywords: Computational chemistry, transition-metal complexes, Homogeneous catalysis, NMR properties, First-principles molecular dynamics simulations.

Dr C S J Cazin (cc111@st-andrews.ac.uk) – *Organic Chemistry*
Keywords: Development of catalysts and processes, Homogeneous catalysis, Organometallic chemistry, Green chemistry, Catalyst design, Asymmetric catalysis.

Dr M L Clarke (mc28@st-andrews.ac.uk) – *Organic synthesis using Homogeneous Catalysts*
Keywords: Asymmetric synthesis, Greener organic chemistry, Homogeneous catalysis, Organometallic chemistry.

Professor D J Cole-Hamilton (djc@st-andrews.ac.uk) – *Organometallic Chemistry, Homogeneous Catalysis*
Keywords: Homogeneous catalysis, Carbonylation, Oxidation, Organometallic, Precursors, MOCVD, Quantum dots.

Dr J A Crayston (jac@st-andrews.ac.uk) – *Catalysis and Materials Science*
Keywords: Electrochemistry, Electrocatalysis, Coordination compounds, Conducting polymers.

Dr G Florence (gjf1@st-andrews.ac.uk) – *Organic Synthesis*
Keywords: Asymmetric synthesis; Synthesis of bioactive natural products and structural analogues; New methods and strategies for acyclic stereocontrol.

Dr G Hähner (gh23@st-andrews.ac.uk) – *Physics and Chemistry at Interfaces*
Keywords: Functional ultrathin organic films, Self-assembled monolayers, Liquid/solid interface, Electronic structure, Photoelectron spectroscopy.

Professor J T S Irvine (jtsi@st-andrews.ac.uk) – *Inorganic Solid State Chemistry, Electronic and Ionic Conducting Materials*
Keywords: Solid state chemistry, Solid state electrochemistry, Superconductors, Fuel cells, Lithium batteries, Ceramics, Oxides.

Professor P C J Kamer (pcjk@st-andrews.ac.uk) – *Homogeneous Catalysis*
Keywords: Homogeneous catalysis, Organometallic chemistry, Ligand design, Transition metalloenzymes.

Dr E R Kay (ek28@st-andrews.ac.uk) –*Organic, Supramolecular and Nanomaterials Synthesis*
Keywords: Self assembly, Hybrid nanocrystal-organic materials, Functional molecules, Artificial molecular machines.

Dr P Kilian (pk7@st-andrews.ac.uk) – *Main Group Chemistry*
Keywords: Synthesis, Organo-element chemistry, Organo-phosphorus and organo-pnictide chemistry, Low and hypercordinated phosphorus chemistry.

Professor P Lightfoot (pl@st-andrews.ac.uk) – *Solid State Chemistry and Crystallography*
Keywords: Structural chemistry, X-ray and neutron diffraction, Microporous solids, Ferroelectrics, Functional materials.

Dr J B O Mitchell (jbom@st-andrews.ac.uk) – *Computational Chemistry*
Keywords: Bioinformatics, enzyme reactions, chemoinformatics, machine learning, solubility, computational toxicology.

Professor R E Morris (rem1@st-andrews.ac.uk) – *The Synthesis of Inorganic-Organic Hybrid Materials*
Keywords: Solid state chemistry, Microporous materials, Catalysts, Layered materials, Dendrimers, X-ray diffraction.

Dr F D Morrison (fm40@st-andrews.ac.uk) – *Materials Chemistry*
Keywords: Electroceramics, Solid state chemistry, Functional oxides, Ferroelectrics, Thin films, Nano-structured oxides.

Professor J H Naismith (jhn@st-andrews.ac.uk) – *Structural Biology using Protein Crystallography*
Keywords: Molecular medicine, Protein structure, Protein crystallography, Mechanistic biochemistry, Drug design.

Dr W Nazarov (wn9@st-andrews.ac.uk) – *Physical Chemistry*
Keywords: Low density polymeric foams, Loaded foams for high energy laser fusion experiments.

Professor S P Nolan (sn17@st-andrews.ac.uk) – *Organic Chemistry*
Keywords: Organometallic chemistry, Homogeneous catalysis.

Professor D O'Hagan (do1@st-andrews.ac.uk) – *Bio-organic and Natural Product Chemistry*
Keywords: Organic synthesis, Biosynthesis, Organo-fluorine chemistry, Stable isotopes, Biotransformations, Chiral compounds, Enzyme chemistry.

Dr D Philp (D.Philp@st-andrews.ac.uk)– *Physical Organic Chemistry, Bio-organic Chemistry*
Keywords: Molecular recognition, Self-assembly, Replication processes, Computational methods, Reaction mechanisms, Crystal engineering.

Professor N V Richardson (nvr@st-andrews.ac.uk) – *Surface Science*
Keywords: Molecular chemisorption processes, Surface characterisation, Scanning probe microscopies, Reflection absorption infra-red spectroscopy.

Dr R Schaub (rs51@st-andrews.ac.uk) – *Surface Science*
Keywords: Surface science, Heterogeneous catalysis, Scanning tunnelling microscopy, Mass spectrometry, Model systems, Metal-oxide surfaces.

Professor A M Z Slawin (amzs@st-andrews.ac.uk) – *Crystallography*
Keywords: Single crystal, X-ray, Sensors, H-bonding, Structure, Receptors.

Dr A Smith (ads10@st-andrews.ac.uk) – *Organic Synthesis*
Keywords: Asymmetric synthesis, Molecular enantiorecognition, Organocatalysis, Asymmetric carbene catalysis, Chiral auxiliary development.

Dr T K Smith (tks1@st-andrews.ac.uk) – *Bio-organic Chemistry*
Keywords: Enzyme chemistry, Phospholipid metabolism, Carbohydrate chemistry, Molecular parasitology, Drug development and Mass spectrometry.

Dr T van Mourik (tvm22@st-andrews.ac.uk) – *Computational Chemistry*
Keywords: ab initio Quantum chemistry, Conformation of biological molecules.

Dr N J Westwood (njw3@st-andrews.ac.uk) – *Organic and Biomolecular Synthesis*
Keywords: Combinatorial synthesis, Bioactive molecules, Organic synthesis.

Professor J D Woollins (jdw3@st-andrews.ac.uk) – *Inorganic Synthesis*
Keywords: Synthesis, Sulfur, Selenium, Phosphorus, Heterocycles, Metal extraction, Inorganic rings and cages.

Dr P Wormald (pw22@st-andrews.ac.uk) – *Solid State NMR*
Keywords: 19F Solid-state NMR.

Professor P A Wright (paw2@st-andrews.ac.uk) – *Microporous and Mesoporous Solids, Heterogeneous Catalysis*
Keywords: Microporous solids, Mesoporous solids, Coordination complex and Enzyme encapsulation, Catalysis, Solid acids, Redox catalysts.

Professor W Zhou (wzhou@st-andrews.ac.uk) – *Electron Microscopy*
Keywords: Solid state structural chemistry, Material chemistry, Oxides, Mesoporous solids.

The School of Chemistry

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W: www.st-andrews.ac.uk/chemistry/prospective/pg

Postgraduate Recruitment & Admissions

University of St Andrews, St Katharine's West,
16 The Scores, St Andrews, Fife KY16 9AX, Scotland, UK

T: +44 (0)1334 463325
F: +44 (0)1334 463330
E: pgrecruitment@st-andrews.ac.uk

Online Prospectus, Subject Leaflets and Admissions information:

www.st-andrews.ac.uk/admissions/pg

Visiting Days

There will be two Visiting Days, 16 November 2011 and 21 March 2012, when you can look round the University and talk informally to staff about courses. Booking for these events is essential. For more information see the prospectus or:
www.st-andrews.ac.uk/admissions/pg/visiting

This leaflet is available in Large Print, Braille or Audio on request to Print & Design: +44 (0)1334 463020

University of St Andrews

600 YEARS

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The University's Terms and Conditions for matriculated students can be found in the PG Sponsio Academica at: **www.st-andrews.ac.uk/pgstudents/rules** as can the Policies for both Taught and Research Postgraduates.

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