

CHEMISTRY

Departmental Facilities

FT-NMR instrumentation includes multinuclear Bruker AVANCE 300, 400, fully automated 400, NEO-500,600 MHz and new NEO-700 MHz spectrometers. The 600 and 700 are equipped for solution and solid state studies.

The X-ray Crystallography Facility is equipped with a state-of-the-art Bruker AXS D8 Venture single crystal X-ray diffractometer. The diffractometer is equipped with four-axis Kappa goniometer, a Photon 100 detector for shutterless data collection and a dual micro-source configuration (Mo, Cu). The diffractometer is used for structure determination of single crystals and can also be used for powder diffraction.

The Surface Analysis facility is equipped with Kratos Nova Axis X-ray photoelectron spectrometer and a FEI Quant 250 Scanning Electron Microscope (SEM). X-ray photoelectron spectroscopy (XPS) is used to analyze the surface chemistry of a solid material. The material can be a powder (e.g. nanomaterials) or a film (organic polymers, inorganic compounds, paints, ink, etc.) deposit on substrates like gold, glass or on a Si wafer. Electron scanning microscopy is a technique used for characterization of micro and nanostructured materials with X-ray spectroscopic capabilities.

The Mass Spectrometry Facility offers mass spec analysis with a variety of instruments and ionisation techniques, including electron impact (EI), chemical ionisation (CI), fast atom bombardment (FAB), field desorption (FD), matrix-assisted laser desorption/ionisation (MALDI) and electrospray ionisation (ESI). For further details see our website. Also available is an Ultra Mass 700 inductively coupled plasma mass spectrometer.

Other spectroscopic equipment includes a Bruker RFS-100 FT-Raman spectrometer; Bruker IFS-25 and Bomem MB-120 FT-IR spectrometers; Beckman DU-64, Hewlett-Packard HP8452A and Varian Cary 3 UV-visible spectrophotometers; several stopped-flow spectrophotometers; and a JASCO circular dichroism spectropolarimeter.

The Photonic and Electronic Materials Laboratory is equipped with a Perkin-Elmer DSC6 and DSC7 and Mettler TA-30 differential scanning calorimeters, three Nikon polarizing microscopes equipped with heating stages, testbeds for the characterization of liquid crystal electrooptical properties, a high-pressure Xe arc lamp source, a Molecular Imaging PicoSPM atomic force microscope equipped with a Hysitron nanoindenter for nanoscale force measurements, a vacuum chamber for chemical vapour deposition, a PTI fluorimeter,

a Perkin-Elmer thermal gravimetric analyzer, a Nicolet IR Spectrometer with attenuated total reflective attachment, and several pulsed and continuous wave laser systems.

A laser photochemistry laboratory is equipped with Lambda Physik LPX 205i excimer and ScanMate 2E tunable dye lasers and a Continuum NdYAG laser and a time-of-flight mass spectrometer with high kinetic energy resolution.

A wide range of analytical equipment is available including electrothermal and flame atomic absorption instruments, gas chromatographs, a Waters Alliance gel permeation chromatography system, HPLC instruments, a scintillation counter, an X-ray fluorescence spectrometer, and instrumentation for research in electro-analytical chemistry, a microfluid research facility with a microfluid tool kit, micro-hot embosser, Nikon microscope with video capture and imaging equipment and access to microfabrication facilities.. A 2500 lbs. MTS tensile tester is used for the physical characterization of polymers. A SLOWPOKE-2 reactor, used for neutron activation analysis, is shared with the Royal Military College.

The Department is fully connected to the Internet and makes extensive use of local area networks. We are connected to the University via a fibre optic back bone, and from there to the world. The front end is a SunSparc Ultra which handles all e-mail and file serving for the Department. Another Sparc handles the World Wide Web pages for the Department. The Department employs a full time Network Administrator as well as Electronics personnel who handle connectivity and configuration issues for all users.

The Department has excellent technical support for research: Electronics and Computer service shop; network and software support in house; glassblowing services; as well as expert NMR, X-Ray, Mass-Spec and Surface Analysis Instruments user support on a full time basis

Financial Assistance

The Department of Chemistry offers support for each full-time student during the first two years in a Master's program and the first four years in a Doctoral program. The current minimum is \$23,000-\$26,500 (MSc) / \$27,600 (PhD) for Canadian and international students per annum. This financial support can come from a variety of sources and can differ from student to student. These sources include: supervisor research grant support (GRF); external scholarships support (NSERC, OGS); Graduate Teaching Assistantships (TA); Research Assistantships (RA) and internal scholarship support., derived from university scholarships



and research and teaching assistantships. Students who hold scholarships and awards will receive a top-up in addition to the minimum stipend. Students who are successful in competition for Natural Sciences and Engineering Research Council Scholarships or other major awards may augment these awards considerably by working as a teaching assistant in the Department.

Fields of Study

A summary of current research interests of each member of the Department of Chemistry is available on our website <https://www.chem.queensu.ca/research-areas> (<https://www.chem.queensu.ca/research-areas/>).

Materials Science and Technology: The Department cooperates with the Departments of Chemical Engineering, Electrical and Computer Engineering, Mechanical and Materials Engineering and Physics in offering courses and research projects to students wishing to concentrate in materials science and technology. Students are registered for M.Sc. and Ph.D. degrees in one of the six departments and are encouraged to take relevant courses from the others.