GRADUATE STUDIES | Department of Chemistry

Synthesis, Catalysis and Molecular Materials

Western Science

WESTERN SCIENCE

Department of Chemistry

The Department of Chemistry at Western University offers a large and vibrant, research-intensive environment for more than 100 graduate students.

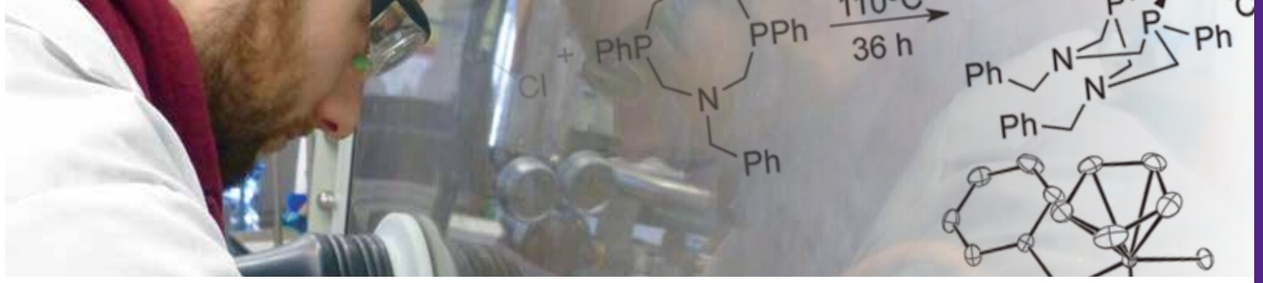
Taking a modern view of the chemical sciences, the four main research themes reflect Western's open-minded and multidisciplinary approach to research. These themes include: Chemical Biology and Biomaterials; Synthesis, Catalysis and Molecular Materials; Materials: Design, Function and Characterization; and Theory and Computation.

We are proud to boast over 25 NSERC-funded researchers, some of whom are Tier I and II Canada Research Chairs and Industrial Research Chairs with numerous links to academic and industrial partners, and some of the finest research facilities in Canada.

Our researchers play leading roles in organizations within Western, including: The Centre for Advanced Materials and Biomaterials Research (CAMBR), Surface Science Western, and the Western Nanofabrication Facility, and publish regularly in top tier peer-reviewed journals. Graduate students can expect their results to be disseminated globally. They may also receive opportunities to conduct applied research in collaboration with industrial partners.

Synthesis, Catalysis, and Molecular Materials

The "Synthesis, Catalysis and Molecular Materials" research theme includes the research programs of eight faculty members in Chemistry encompassing organic, main group, and transition metal components. These research programs include expertise on the synthesis of natural products and developing new synthetic methods in organic chemistry; the incorporation of heavier main group elements into electronic and polymeric materials; organometallic and supramolecular polymers; functional nanostructured semiconductor materials; molecular machines and anion recognition materials; and finely tuned homogeneous metal catalysts. Students receive advanced instrument training in all of these programs including NMR spectroscopy, mass spectrometry, powder and single crystal X-ray diffraction, and absorption and emission spectroscopies.



The Baines Group

Kim Baines, Professor

PRIMARY RESEARCH FOCUS

The foundation of the Baines' research program is the synthesis and reactivity studies of main group compounds with interesting bonding paradigms, particularly those of low valent heavy Group 14 elements. To advance innovative applications of this chemistry, we have developed unique probes to gain insights into the mechanisms of the additional reactions of these compounds and then applied our knowledge to the synthesis and chemistry of main group polymers with unique functionalities.

RECENT PUBLICATIONS

P. A. Rupar, V. N. Staroverov, K. M. Baines* "Reactivity Studies of N-Heterocyclic Carbene Complexes of Germanium(II)" *Organometallics* **2010**, *29*, 4871–4881.

P. A. Rupar, V. N. Staroverov, K. M. Baines* "A Cryptand-Encapsulated Germanium(II) Dication" *Science*, **2008**, *322*, 1360–1363.

"Working for Prof. Kim Baines throughout my degree was an extremely rewarding learning experience. She is a very rigorous scientist and encourages strong critical thinking. Prof. Baines fosters a creative research environment, allowing students the freedom to follow different research inquiries. She encourages participation in collaborations which enabled me to widen my area of expertise, to network and to establish my place in the scientific community."

– Paul Rupar, PhD

ACCOMPLISHMENTS AND PAST GRADUATES

PhD graduates from Baines Group are now employed as:

- Assistant Professor, University of Alabama
- Faculty Lecturer, McGill University
- Research Scientists at Piramal, Apotex Pharmachem, Suncor
- MSc graduates are employed at the following companies as research technicians: Accucaps and Green Centre Canada

FOR MORE INFORMATION

http://publish.uwo.ca/~kbaines2/
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The Blacquiere Group

Johanna Blacquiere, Assistant Professor

PRIMARY RESEARCH FOCUS

The Blacquiere Group develops high-performance catalysts for applications in sustainable synthesis using abundant and clean reagents, such as water and dioxygen. Highly selective functionalization is achieved through catalyst structures that exploit cooperative reactivity. The resulting efficient catalysts have the potential to alter synthetic strategies and will ultimately be applicable to the synthesis of high-value products in the fine chemicals industry.

OUTSTANDING FACILITIES, TOOLS AND TECHNOLOGIES

A broad range of analytical tools are available to support the Blacquiere Group's non-standard research techniques such as dynamic NMR spectroscopy and MALDI MS.

RECENT PUBLICATIONS

J. M. Blacquiere, C. S. Higman, S. I. Gorelsky, N. J. Beach, S. Dalgarno, D. E. Fogg* "Unprecedentedly Strong Binding of Dinitrogen at Ruthenium" *Angew. Chem. Int. Ed.* **2011**, *50*, 916–919.

J. M. Blacquiere, R. McDonald, D. E. Fogg* "Integrating the Schrock and Grubbs Catalysts: Ruthenium-Binaphtholate Catalysts for Olefin Metathesis" *Angew. Chem. Int. Ed.* **2010**, *49*, 3807–3810.

"In conducting my research I frequently interact with individuals who are experts in a breadth of analytical tools and techniques. I have developed strong research skills including air-sensitive synthesis of catalysts, characterization of these species and catalytic testing. Being exposed to organic, inorganic, and analytical research fields makes me well-rounded and more marketable."

– James Stubbs, BSc

FOR MORE INFORMATION

http://www.uwo.ca/chem/people/faculty/blacquiere_johanna.htm
or contact jblacqu2@uwo.ca

Academic Snapshot

30
full-time faculty

100+
full-time graduate students

Over 7,500
students taught annually

2,500th BSc
by 2014

200th PhD
by 1986

475th PhD
by 2014

A Tradition of Research

Average annual research revenue
$4,000,000

FIRST
publication in 1915

100
publications by 1962

1,000
publications by 1975

2,000
publications by 1985

6,000
publications by 2012

The Corrigan Lab

John Corrigan, Professor

PRIMARY RESEARCH FOCUS

The primary research focus of the Corrigan Lab is on inorganic materials synthesis with expertise on the controlled assembly of nanoscopic semiconductor complexes. Functionalized semiconductor architectures are prepared and specific properties are incorporated into (or onto) the frameworks via a "molecular precursor approach". The size-dependent photophysical properties that they display offer applications in areas encompassing energy (e.g., sensitized solar cell materials), sensors and light emitting diodes.

INDUSTRIAL, ACADEMIC AND OTHER COLLABORATORS

Academic and research institute collaborators include Professors Y. Huang, and G. Fanchini, Western University; Professor S. Dehnen, Marburg University, Germany; and, Drs. C. Kuebel, A. Eichhöefer and D. Fenske, Karlsruhe Institute of Technology, Germany.

OUTSTANDING FACILITIES, TOOLS AND TECHNOLOGIES

We offer advanced inorganic nanomaterials synthesis laboratories with access to state-of-the-art characterization facilities including X-ray diffraction and NMR spectroscopy.

RECENT PUBLICATIONS

M. Azizpoor Fard, B. Khalili Najafabadi, M. Hesari, M. S. Workentin*, J. F. Corrigan* "New Poly-silylchalcogen Reagents for the Generation of Polyferrocenyl Assemblies" *Chem. Eur. J.* **2014**, *20*, 7037–7047.

C. B. Khadka, B. Khalili Najafabadi, M. Hesari, M. S. Workentin*, J. F. Corrigan* "Copper-chalcogenide Clusters Stabilized with Ferrocene Based Diphosphine Ligands" *Inorg. Chem.* **2013**, *52*, 6798–6805.

C. B. Khadka, A. Eichhöfer, F. Weigend*, J. F. Corrigan* "Zinc Chalcogenolate Complexes as Molecular Precursors to Mn(II) containing ZnE (E= S, Se) Clusters" *Inorg. Chem.* **2012**, *51*, 2747–2756.

"In the Department, all the facilities vital for research progress are present. It is not only about the instruments – it is about professionals who work there, who have expertise in their area and willingness to share the knowledge, to train you and to assist you in your research. People who work here are the key to success. Their experience and energy are invaluable."

– Tanya Levchenko, PhD student

ACCOMPLISHMENTS AND PAST GRADUATES

Graduates have been sought out by industry, securing positions such as Research and Development Director, Asia CMP Technologies for Dow Chemical Company, Global Product Management for BASF SE, and Research Scientist for Imperial Oil.

FOR MORE INFORMATION
http://publish.uwo.ca/~jfcorrig/
or contact corrigan@uwo.ca

The Gilroy Group

Joe Gilroy, Assistant Professor

PRIMARY RESEARCH FOCUS

The Gilroy Group's research falls broadly within the areas of inorganic, polymer, and materials chemistry. All of our projects involve a significant synthetic aspect, but we are also heavily engaged in the evaluation of the materials we produce using techniques such as electrochemistry, gel permeation chromatography, multinuclear NMR spectroscopy, and X-ray crystallography. Our projects are designed with applications in mind, ranging from catalysis and water purification to solar energy conversion.

OUTSTANDING FACILITIES, TOOLS AND TECHNOLOGIES

We are fully equipped to conduct air and moisture sensitive chemistry and have access to a full complement of polymer characterization and electrochemistry tools.

RESEARCH AWARDS AND PUBLICATIONS

Dr. Gilroy is the recipient of the 2014 Thieme Chemistry Journal Award and the Western Petro-Canada Young Innovator Award. Since 2012, junior members of the Gilroy Group have published several first-author publications and received significant scholarship funding (NSERC/OGS).

"As a member of the Gilroy Group I am engaged in fast-paced, multidisciplinary research projects in the alternative energy field. I am acquiring a diverse set of skills in a highly collaborative environment, including the synthesis of materials to the fabrication and evaluation of solar cells that will open the door to a wide range of career opportunities in the future."

– Stephanie Barbon, PhD student

FOR MORE INFORMATION
http://publish.uwo.ca/~jgilroy5/
or contact joe.gilroy@uwo.ca

The Kerr Group

Mike Kerr, Professor

PRIMARY RESEARCH FOCUS

The Kerr Group is engaged in the development of new and useful synthetic organic reactions and the application of these and other reactions to the synthesis of bioactive naturally occurring molecules.

RESEARCH AWARDS

Faculty Scholar Award (2008-2010)

"In our group we attempt to solve classic synthetic organic chemistry problems, whether through methodological development or the total synthesis of target molecules. The skills we develop under the mentorship of Dr. Kerr prepare us well for work in the pharmaceutical industry as medicinal or process research chemists."

– Michael Emmett, PhD student

RECENT PUBLICATIONS

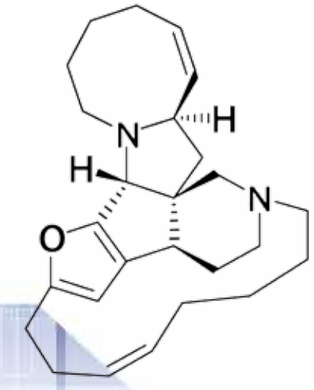
W.J. Humenny, P. Kyriacou, K. Sapeta, A. Karadeolian, M. A. Kerr* "Multicomponent Synthesis of Pyrroles from Cyclopropanes: A One-Pot Palladium(0)-Catalyzed Dehydrocarbonylation/Dehydration" *Angew. Chem. Int. Ed.* **2012**, *51*, 11088–11091.

A. Karadeolian, M. A. Kerr* "Total Synthesis of (+)-Isatisine A" *Angew. Chem. Int. Ed.* **2010**, *49*, 1133–1135.

ACCOMPLISHMENTS AND PAST GRADUATES

Students in the Kerr Group have received four CGS-D, seven CGS-M, four PGS-D, two PGS-M, and three OGS scholarships during the past decade. In addition, during this time, graduates of the group have received five NSERC PDF awards. Kerr Group alumni have gone on to work with pharmaceutical companies such as Tranzyme, Novartis, Bristol Myers Squibb, Amgen, Millenium Pharmaceuticals, GlaxoSmithKline, Triventis, Apotex, Pfizer, and Alphora.

FOR MORE INFORMATION
http://publish.uwo.ca/~makerr/index.htm
or contact makerr@uwo.ca



The Pagenkopf Group
Brian Pagenkopf, Professor

PRIMARY RESEARCH FOCUS
The Pagenkopf Group is broadly engaged in synthetic organic chemistry, with particular interest in the total synthesis of natural products and the development of new synthetic methods. Much of our recent work has focused on discovering new reactions of strained ring or catalyst systems and their applications in total synthesis.
We are also preparing novel materials based on the silole chromophore for biomedical applications.

“The exceptional quality of the faculty in the Department of Chemistry proves to be an invaluable resource for dedicated and inquisitive students.”

– Andrew Stevens, PhD

FOR MORE INFORMATION
http://publish.uwo.ca/~bpagenko/
or contact bpagenko@uwo.ca

The Ragogna Research Group
Paul Ragogna, Professor

PRIMARY RESEARCH FOCUS
The Ragogna Group’s research is solidly grounded in synthetic chemistry, specifically with a focus on the main group elements. Our work seeks to probe and understand the limits of the structure, bonding and reactivity of the p-block. Moreover, we endeavour to use what we learn from the fundamental studies to enhance our work on applied surface chemistries such as ion exchange, antimicrobial effects, superhydrophobicity/hydrophilicity, and flame retardants.

INDUSTRIAL, ACADEMIC AND OTHER COLLABORATORS
Our industrial collaborators include Cytec Industries and 3M Canada.

OUTSTANDING FACILITIES, TOOLS AND TECHNOLOGIES
We offer access to a full complement of inert atmosphere synthetic capabilities; high pressure PH_3 lines; and a UV curing apparatus for coatings production.

RESEARCH AWARDS
Dr. Ragogna recently received the Strem Chemical award for Pure or Applied Inorganic Chemistry for his outstanding contribution to inorganic chemistry in Canada and for demonstrating exceptional promise in this field.

RECENT PUBLICATIONS
J. W. Dube, C. M. E. Graham, C. L. B. Macdonald, Z. D. Brown, P. P. Power, P. J. Ragogna* “Reversible, Photoinduced Activation of P_4 by Low-Coordinate Main Group Compounds” *Chem. Eur. J.* **2014**, *22*, 6739–6744.

J. W. Dube, Z. D. Brown, C. A. Caputo, P. P. Power, P. J. Ragogna* “Activation of Gaseous PH_3 by Low Coordinate Diaryltetrylene Compounds” *Chem. Commun.* **2014**, *50*, 1944–1946.

R. Guterman, M. Hesari, P. J. Ragogna*, M. S. Workentin* “Anion-Exchange Reactions on a Robust Phosphonium Photopolymer for the Controlled Deposition of Ionic Gold Nanoclusters” *Langmuir* **2013**, *29*, 6460–6466.

“Working in the Ragogna Group is a wonderfully interactive research experience. Every day we set up reactions that are a small step towards a bigger picture in the development of main group chemistry. Paul is an excellent supervisor who is very hands-on and passionate about chemistry.”

– Jonathan Dube, PhD

ACCOMPLISHMENTS AND PAST GRADUATES
Students who graduate from the Ragogna Group have secured positions in industry at Wellington Chemical, FPInnovations and 3M Canada, and in academia at LaTrobe University, Australia and Baylor University, USA.

FOR MORE INFORMATION
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or contact pragogna@uwo.ca

The Wisner Research Group
James Wisner, Associate Professor

PRIMARY RESEARCH FOCUS
The Wisner Group is interested in the design, synthesis and characterization of new molecules that associate with each other in specific ways using multiple weak, non-covalent interactions. The use of such interactions allows for the strong, reversible and selective complexation of specific molecules by our designed hosts (termed molecular recognition) that can further result in the self-assembly of complex nanoscale structures that may be engineered to provide unique behaviours in materials based on them.

“Since the first day I joined Professor Wisner’s group I have found full support and attention to the progress of my project as well as the development of my chemical skills. I have been encouraged to look for solutions and alternatives to solve everyday challenges with the guidance and feedback of my supervisor, who politely and constructively points out the pros and cons of each course of action proposed.”

– Iamnica Linares, PhD student

ACCOMPLISHMENTS AND PAST GRADUATES
Wisner Group students have graduated to take on careers both in academia as early career professors in the UK and China and as professional chemists in industry at Apotex, Toronto.

FOR MORE INFORMATION
http://publish.uwo.ca/~jwisner/index.html
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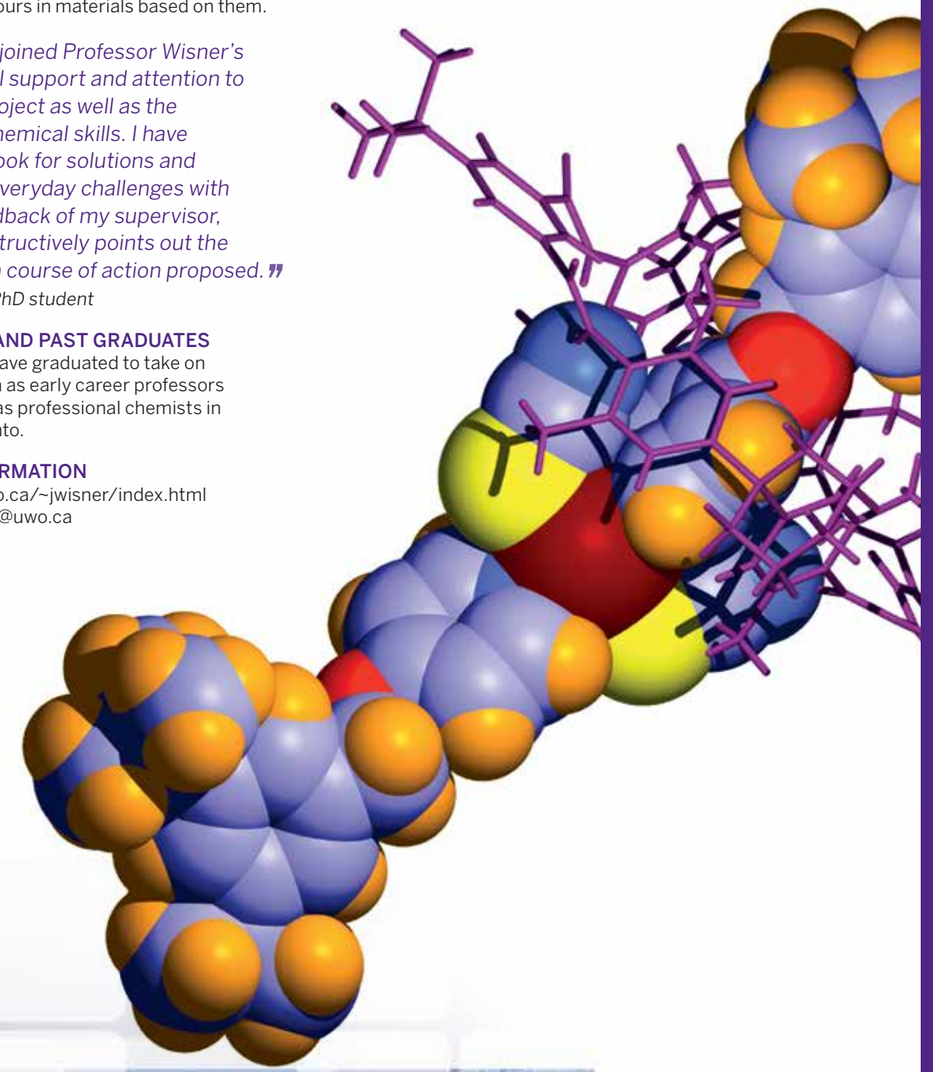

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