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Michael W. Gaultois

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EDUCATION

M.Sc. Chemistry. 2009 – 2011 (*expected*).
University of Saskatchewan, Saskatoon, Saskatchewan, Canada

B.Sc. Honours, Chemistry. First-Class Standing, 2004 – 2009.
University of Alberta, Edmonton, Alberta, Canada

RESEARCH

2009 - 2011:
M.Sc. Chemistry project
Supervisor: Andrew Grosvenor at the *University of Saskatchewan, Department of Chemistry*.

The effect of coordination number and electronegativity on final-state relaxation and X-ray spectral energies.

Due to their chemical selectivity and the large amount of information that can be gained about the charge and coordination number (CN) of an element, X-ray absorption near-edge spectroscopy (XANES) and X-ray photoelectron spectroscopy (XPS) are routinely used to study metal centres in a variety of synthetic (e.g., alloys, ceramics, films) and natural (e.g., plants, soils) matrices. However, many competing effects influence spectral energies, and the ability to separate these effects is difficult. This is the first systematic study to clarify the role that coordination environment, both the number and type of coordinated atoms, plays in BE shifts. Standard techniques, such as X-ray diffraction, are ineffective to study amorphous materials, making spectroscopic studies like those conducted here invaluable to the understanding of these industrially-relevant materials.

2008:
Natural Sciences and Engineering Research Council of Canada Undergraduate Student Research Award (NSERC USRA) project
Supervisor: Frederick G. West at the *University of Alberta, Department of Chemistry*.

Toward the ene-electrocyclization of hydrazones.

Linear alpha-olefins are cheap and readily available feedstock materials used primarily in industrial polymerization reactions. These carbon chains are usually joined through reactions involving metal catalysts, which are expensive, or strong acids, which are unselective and require considerable purification. I used hydrazones as model substrates to investigate ene-electrocyclization reactions, with the goal of using thermal ene-like reactions to couple alpha-olefins, rapidly build complexity in few steps, and provide reactive handles for applications in synthesis.

2007:
B.Sc. Honours project
Supervisor: Arthur Mar at the *University of Alberta, Department of Chemistry*.

Ternary arsenides $Zr(Si_xAs_{1-x})As$ with $PbCl_2$-type ($0 \leq x \leq 0.4$) and PbFCl-type ($x = 0.6$) structures.

The motivation of this research, which served as the basis of my undergraduate thesis, was to understand mixed-anion compounds that adopt structures different from the parent binaries because of stabilization through differential fractional site occupancy (DFSO). This phenomenon had been observed in rare instances for mixed-anion systems, and was neither studied nor well-understood. In addition to having explored and solved the Zr-Si-As system and revealing new ternary compounds, we communicated important details about the nature of the bonding in these materials, contributing to our understanding of bonding in a broader context. I synthesized all materials and solved the 3-component phase diagram at 900°C. For $ZrSi_{1.6}As_{1.4}$, I solved the crystal structure, performed the theoretical (LMTO) calculations and electrical resistivity measurements, and interpreted XPS data.

2006:
NSERC USRA project, Reactive Intermediates Student Exchange (RISE) Scholar.
Supervisor: William G. Skene at l'*Université de Montréal, Département de chimie*.

Controlled synthesis of water soluble polymers for use as OLED hole injection layers.

Imine formation is an easy condensation between amino and aldehyde functionalized monomers that gives polymers with tuneable properties. Amino and aldehyde functionalized monomers were reacted to form water soluble polymers with tuneable photophysical properties for potential use as hole injection layers in organic light-emitting diodes (OLED). I synthesized all the materials, and subsequently characterized polymer physical and photophysical properties.

2005:
NSERC USRA project
Supervisor: Vincent St. Louis at the *University of Alberta, Department of Biological Sciences, University of Alberta Low-Level Mercury Analytical Laboratory.*

Methylated mercury species in marine waters of the Canadian high and sub Arctic.

I performed quality control and quality assessment on all samples, treated and analyzed field samples according to strict protocol in a class 100 clean room, and prepared samples for analysis and determined total mercury in water by oxidation, purge and trap, and cold vapour atomic fluorescence spectrometry.

PEER-REVIEWED PUBLICATIONS

11) B. R. Slater, H. Bie, M. W. Gaultois, S. S. Stoyko, A. Mar. (2011) Rare-Earth Cobalt Gallides $RE_4Co_3Ga_{16}$ (*RE* = Gd–Er, Y): Self-Interstitial Derivatives of RE_2CoGa_8. *European Journal of Inorganic Chemistry*. In press. DOI: 10.1021/ejic.201100283 (Honours project, U. Alberta).

10) J. A. Sigrist, M. W. Gaultois, A. P. Grosvenor. (2011) Investigation of the Fe K-edge XANES spectra from $Fe_{1-x}Ga_xSbO_4$: Local versus nonlocal excitations. *Journal of Physical Chemistry A*. 115: 1908-1912. DOI: 10.1021/jp111520r (M.Sc. work, U. Saskatchewan)

9) M. W. Gaultois, A. P. Grosvenor. (2011) XANES and XPS investigations of $(TiO_2)_x(SiO_2)_{1-x}$: the contribution of final-state relaxation to shifts in absorption and binding energies. *Journal of Materials Chemistry*. 21: 1829-1836. DOI: 10.1039/C0JM03464A (M.Sc. work, U. Saskatchewan).

8) M. W. Gaultois, A. P. Grosvenor. (2010) Coordination-induced shifts of absorption and binding energies in the $SrFe_{1-x}Zn_xO_{3-\delta}$ system. *Journal of Physical Chemistry C*. 114: 19822-19829. DOI: 10.1021/jp108117d (M.Sc. work, U. Saskatchewan).

7) M. W. Gaultois, J. E. Greedan, A. P. Grosvenor. (In press, 2010) Investigation of coordination changes in substituted transition-metal oxides by K-edge XANES: beyond the pre-edge. *Journal of Electron Spectroscopy and Related Phenomena*. DOI: 10.1016/j.elspec.2010.08.002 (M.Sc. work, U. Saskatchewan).

6) A. C. Sklad, M. W. Gaultois, A. P. Grosvenor. (2010) Examination of $CeFe_4Sb_{12}$ upon exposure to air: Is this material appropriate for use in terrestrial, high-temperature thermoelectric devices? *Journal of Alloys and Compounds*. 505: L6-L9. DOI: 10.1016/j.jallcom.2010.05.167 (M.Sc. work, U. Saskatchewan).

5) M. W. Gaultois, A. C. Sklad, A. P. Grosvenor. (2010) Effects of Metal Substitution on the Electronic Structure of Mixed Ionic-Electronic Conduction Materials. *Canadian Light Source Activity Report 2009*. www.lightsource.ca/science/activity_report_2009.php (M.Sc. work, U. Saskatchewan).

4) M. W. Gaultois, A. P. Grosvenor, P. E. R. Blanchard, A. Mar. (2010) Ternary arsenides $Zr(Si_xAs_{1-x})As$ with $PbCl_2$-type ($0 \leq x \leq 0.4$) and PbFCl-type ($x = 0.6$) structures. *Journal of Alloys and Compounds*. 492: 19-25. DOI: 10.1016/j.jallcom.2009.11.125 (Honours project, U. Alberta).

3) S. Dufresne, M. Gaultois, W. Skene. (2008) Environmentally friendly preparation of a conjugated polyazostilbene: A photophysical and electrochemical investigation. *Optical Materials*. 30(6): 961-967. DOI: 10.1016/j.optmat.2007.05.031 (NSERC USRA project, Université de Montréal).

2) S. Dufresne, M. Gaultois, W. Skene. (2007) Disodium 5,5'-diamino-2,2'-ethylenedibenzenesulfonate tetrahydrate. *Acta Crystallographica, Section E*. E63(11). DOI: 10.1107/S1600536807049410 (NSERC USRA project, Université de Montréal).

1) S. Dufresne, M. Gaultois, W. G. Skene. (2007) Bis(triethylammonium) 4,4'-diamino-trans-stilbene-2,2'-disulfonate. *Acta Crystallographica, Section E*. E63(10). DOI: 10.1107/S1600536807041360 (NSERC USRA project, Université de Montréal).

SCHOLARLY PRESENTATIONS

10) M. W. Gaultois,* A. P. Grosvenor. (2011) XANES determination of metal coordination environments in amorphous TiO_2-SiO_2 and ZrO_2-TiO_2-SiO_2 metal silicates. *Canadian Light Source 14th Annual Users' Meeting*. (Poster; national conference; M.Sc. work).

9) M. W. Gaultois. (2011) Determining the role of final-state relaxation in XANES and XPS energy shifts in transition-metal silicates. *North American Solid State Chemistry Conference*. (Oral presentation; international conference; M.Sc. work).

8) M. W. Gaultois. (2011) Le rayonnement synchrotron et son application pour l'étude des oxydes et silicates métalliques. *ACFAS 6e Forum du Savoir*. (Invited talk; regional conference; M.Sc. work).

7) M. W. Gaultois (2010) Presentation to the Governor General of Canada, Her Excellency the Right Honourable Michaëlle Jean. *Canadian Light Source*. (Invited talk; M.Sc. work).

6) M. W. Gaultois,* A. P. Grosvenor. (2010) Effect of substitution on coordination and electronic structure in amorphous $(MO_2)_x(SiO_2)_{1-x}$ (M = Ti, Zr) silicates. *Gordon Research Conference: Solid State Chemistry*. (Poster; international conference; M.Sc. work).

5) M. W. Gaultois*, A. P. Grosvenor. (2010) Shifts in $SrFe_{1-x}Zn_xO_{3-\delta}$ absorption energies and binding energies: influencing the magnitude of final-state relaxation by changing the metal coordination number. *VUVX2010*. (Poster; international conference; M.Sc. work).

4) M. W. Gaultois*, A. P. Grosvenor. (2010) Effect of Ti substitution on coordination and electronic structure in amorphous $(TiO_2)_x(SiO_2)_{1-x}$ silicates. *Canadian Light Source 13th Annual Users' Meeting*. (Poster; national conference; M.Sc. work).

3) M. Gaultois*, A. P. Grosvenor, and A. Mar. (2008) Three New Ternary Compounds in the Zr–Si–As System. *CSC 91st Canadian Chemistry Conference and Exhibition*. (Poster; national conference, honours project).

2) M. Gaultois*, A. P. Grosvenor, and A. Mar. (2008) Three New Ternary Compounds in the Zr–Si–As System. *22nd annual Western Canadian Undergraduate Chemistry Conference*. (1st place award-winning oral presentation; regional conference; honours project).

1) M. Gaultois*, W. Skene. (2006) Controlled Synthesis of Water Soluble Polymers. *11th annual Reactive Intermediates Student Exchange (RISE) workshop*. (Oral presentation; NSERC USRA project, Université de Montréal).

SELECTED POST-SECONDARY HONOURS AND AWARDS

2011:

- Vanier Canada Graduate Scholarship *(declined)* — $150,000
- NSERC Canada Graduate Scholarship *(declined)* — $105,000
- NSERC Postgraduate Scholarship — $63,000

2010:

- International Fulbright Science & Technology Award, *Institute of International Education*. (2011 - 2014)
- Gerhard Herzberg Memorial Scholarship, *U. Saskatchewan*. — $8,000
- Chosen by the Canadian Light Source to present my research to the Governor General of Canada, Her Excellency the Right Honourable Michaëlle Jean, during her official visit to Saskatchewan. (Presentation in French) *Canadian Light Source*.
- Julie Payette-NSERC Research Scholarship, held at *U. Saskatchewan*. — $25,000
- VWR International Graduate Award, held at *U. Saskatchewan*. — $3,000
- Valedictorian, Faculty of Science class of 2010, *U. Alberta*.
- The Gold Medal in Chemistry, *U. Alberta*. — $1,300
- The Dean's Silver Medal in Science, *U. Alberta.*

2009:

- Judith Lynn Millar Memorial Scholarship, *U. Alberta*. — $2,750
- Rod and Judith Fraser International Undergraduate Learning Award, held at *Yonsei University, Republic of Korea*. — $6,400
- University of Alberta Ambassador Abroad Award, held at *Yonsei University, Republic of Korea*. — $1,200
- Outstanding Executive Member, *East Campus Students' Association*.
- Dean's Honour Roll, first class standing, *U. Alberta*.

2008:

- Peter Lougheed Scholarship, held at *U. Alberta*. $10,000
- NSERC Undergraduate Student Research Award (USRA), held at *U. Alberta, Department of Chemistry*. $6,400
- Reuben Benjamin Sandin Memorial Achievement Scholarship in Chemistry, *U. Alberta*. $3,000
- Arthur Bollo-Kamara Award, Association of the Chemical Profession of Alberta (ACPA). $1,000
- Justice Tevie Miller Involvement Award, *U. Alberta*. $1,000
- First prize, best oral presentation in inorganic and materials division, Western Canadian Undergraduate Chemistry Conference (WCUCC) $150
- American Chemical Society (ACS) Analytical Chemistry Award, *U. Alberta*.
- Dean's Honour Roll, first class standing, *U. Alberta*.

2007:

- Dr. Robert Schutte Award in Science, *U. Alberta*. $1,000
- Java Jive Merchants Student Achievement Award, *U. Alberta*. $1,000
- Dean's Honour Roll, first class standing, *U. Alberta*.

2006:

- Reactive Intermediates Student Exchange (RISE) research placement, held at *l'Université de Montréal, Département de chimie*.
- NSERC USRA, held at *l'Université de Montréal, Département de chimie*. $6,400
- Mar Prize in Inorganic Chemistry, *U. Alberta*. $500
- Coca-Cola Student Achievement Award, *U. Alberta*. $1,000
- Dean's Honour Roll, first class standing, *U. Alberta*.

2005:

- T4K Undergraduate Leadership Scholarship, *U. Alberta*. $1,750
- University of Alberta Undergraduate Scholarship, *U. Alberta*. $1,000
- Residence Life Scholarship, *U. Alberta*. $500
- Edmonton Coin Vending Award, *U. Alberta*. $500
- David Johnson Memorial Award, *U. Alberta*. $100
- NSERC USRA, held at *University of Alberta Low-Level Mercury Analytical Laboratory*. $5,625
- Justice Tevie Miller Gold Key Society, Gold Key Recognition Award for outstanding contributions to campus and community, *U. Alberta*.
- Lister Hall Students' Association Community Award, *Henday Hall, Lister Centre*.
- Dean's Honour Roll, first class standing, *U. Alberta*.

2004:

- Academic Excellence Scholarship, *U. Alberta*. $2,500
- Faculty of Science Academic Excellence Scholarship, *U. Alberta*. $1,000
- University of Toronto National Book Award for "superior academic performance; original and creative thought; exceptional achievement in a broad context."
- [British Columbia] Provincial Scholarship Award for excellence. $1,000

TEACHING EXPERIENCE

Lab teaching assistant

2010:

- CHEM 115 (General Chemistry II). *U. Saskatchewan*.
  35 contact hours, (n = 48). Supervisor: Dr. Alexandra Bartole-Scott
- CHEM 231.3 (Inorganic Chemistry I). *U. Saskatchewan*.
  40 contact hours, (n = 14). Supervisor: Dr. Pia Wennek
- CHEM 231.3 (Inorganic Chemistry I). *U. Saskatchewan*.
  40 contact hours, (n = 18). Supervisor: Dr. Pia Wennek

2009:

- CHEM 112 (General Chemistry I). *U. Saskatchewan*.
  35 contact hours, (n = 48). Supervisor: Dr. Alexandra Bartole-Scott
- CHEM 112 (General Chemistry I). *U. Saskatchewan*.
  35 contact hours, (n = 47). Supervisor: Dr. Alexandra Bartole-Scott

2007:

- CHEM 261 (Organic Chemistry I). *U. Alberta*.
  30 contact hours, (n = 18). Supervisor: Dr. Karen Kawulka
- CHEM 263 (Organic Chemistry II). *U. Alberta*.
  30 contact hours, (n = 19). Supervisor: Dr. Karen Kawulka

ELECTED POSITIONS AND APPOINTMENTS

Professional		
Chemical Institute of Canada Edmonton Section	Secretary	2007 - 2009
Academic		
Graduate Affairs Committee, *Chem. Dept., U. Saskatchewan*	Member	2009 - 2011
Chemistry Course Council, *U. Saskatchewan*	Secretary	2009 - 2011
Chemistry Students' Association, *U. Alberta*	Vice President Internal	2007 - 2008
General Faculties Council, *U. Alberta*	Representative	2007 - 2008
U. Alberta Science Undergraduate Society	Director	2005 - 2006
U. Alberta Gold Key Society	Director	2008 - 2009
U. Alberta Gold Key Society	President	2007 - 2008
U. Alberta Gold Key Society	Vice President	2006 - 2007
Student residence		
East Campus Students' Association, *U. Alberta*	President	2007 - 2008
U. Alberta Residence Halls Association	Representative	2007 - 2008
Lister Hall Students' Association, *U. Alberta*	Floor Coordinator	2005 - 2006
Lister Hall Foods Committee, *U. Alberta*	Representative	2004 - 2007
Lister Hall Public Relations Committee, *U. Alberta*	Representative	2004 - 2007

Community Outreach

Lotte World, *Seoul, South Korea*	Student Ambassador	2009	-	2009
Campus Sustainability Coalition, *U. Alberta*	Communications Director	2007	-	2009
Science FUNdamentals, *U. Alberta*.	Vice President External	2007	-	2008
Campus Ambassadors, *U. Alberta*	Team Facilitator	2006	-	2007
Finance Sub-committee to the Executive Committee, Circle K International (CKI) International Board, *Indiana, USA*	Secretary	2007	-	2008
District Board, CKI Western Canada District	Governor	2006	-	2007
District Board, CKI Western Canada District	Lieutenant Governor	2005	-	2006
Projects Board, CKI U. Alberta Chapter	Member	2005	-	2005

Languages

English	Fluent
French	Fluent
Korean	Conversational