**CURRICULUM VITAE**

**Marcel Schlaf, Ph.D., *Diplom-Chemiker***

**Professor of Chemistry**

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**Executive Summary & Recent Highlights**

* PI on two successful CFI application valued at 400,000 $ (2001 – Suite of GC, GC-MS and HPLC-UV/VIS/RI instruments) and 600,000 $ (2011 – High Pressure Hydrogenation Laboratory).
* Numerous invited lectures nationally, internationally and at major conferences, e.g., most recently at the Organometallic Gordon Conference (Newport, RI, July 2017) and CatBior 2017 (Lyon, France, December 2017) and at Los Alamos National Laboratory (March 2018), 2nd Bauxite Residue Valorisation and Best Practices, (Athens, Greece, May 2018), CatBior 2019 (Turku, Finland 2019).
* In the past 10 years > 3 million dollars in total research funding from NSERC, OMAFRA, US Department of Energy, Rio Tinto ALCAN and others.
* 53 publications in high-quality journals including recently *RSC Green Chemistry*, *RSC* *Energy Environ. Sci, RSC Advances, Inorganica Chimica Acta, Can. J. Chem., J. Mol. Cat. A, Nature Chemistry* and *ACS Catalysis*.
* Appointed to Grant Review Panels by the US Department of Energy
* 22 year ongoing research collaboration with Los Alamos National Laboratory (to switch to Oak Ridge National Laboratory, as my current collaborator Dr. Andrew Sutton is becoming group leader there).
* Research on Red Mud utilization highlighted in *C&EN News* (Chem. Eng. News, 2010, 88 (43), pp 50–51) and *MacLean’s Magazine* (28/10/2010).
* Appointed as a Visiting Professor at the Dalian Institute for Chemical Physics (DICP), Chinese Academy of Sciences, (4 year Appointment 2015-19).
* Editorial Board Member of the *Chinese Journal of Catalysis*.
* Over the last few years trained 25+ undergraduate, 8 M.Sc. and 3 Ph.D. graduate students and 5 post-doctoral fellows and hosted Prof. Diana Quintao Lima (UFMG Belo Horizonte, Brazil) and Nakisha Marks (CARICOM Scholar, University of the West Indies, St. Augustine, Trinidad) as visiting researchers.
* Appointed to the Scientific Organizing Committees of the CATBIOR 2013 (Dalian, China), 2015 (Rio de Janeiro, Brazil) and 2017 (Lyon, France) and 2019 (Turku, Finland) and the 2015 (Leuven, Belgium and 2018 (Athens, Greece) Bauxite Residue Valorisation and Best Practices Conferences – *in all cases as the only Canadian* !
* Co-edited (with Conrad Zhang, DICP) and published a two-volume book entitled “*Reaction Pathways and Mechanisms in Thermocatalytic Biomass Conversion Volume I & II*” (Springer, 2016)
* Served on several university-level committees: UofG Senate for representative for CPES/Department of Chemistry, UofG Senate Research Board, UofG Strategic Renewal Advisory Board. Currently Department of Chemistry Graduate Coordinator.

**Research Synopsis**

Research in the Schlaf Group focuses on the development of both homo- and heterogeneous catalytic processes for the transformation of (hemi-)cellulose derived sugar-derivatives, e.g., furfural, xylitol or sorbitol to value-added products, notably - or -diols, such as 1,6-hexanediol or 1,4- and 1,5-pentanediol. These diols are directly usable as components for the large-scale industrial production of polyesters and polyurethanes.
i) *Homogeneous catalysts:* Figure 1 summarizes the evolution of the homogeneous catalysts conceived, synthesized, and tested over the last 20 years, with each catalyst representing ~3 wo\man years of research involving ligand and catalyst synthesis on a multi-gram scale, > 100 test reactions in a high-pressure hydrogenation reactor, followed by quantitative analysis of the complex reaction mixture and statistical data analysis. A key feature of the catalyst evolution is the increase in metal-chelation by the ligand postulated to lead to higher temperature-stability, a phenomenon, which now also explored by theoretical projects (New M.Sc. student 2020 and a 250,000 $ NFRF application entitled “*Predicting Metal Complex Stability Constants by Combining Experimental Data, Statistics and Machine Learning Methods*” submitted in collaboration with UG computer scientists and statisticians).



**Figure 1:** Evolution of the rational design of high-temperature, acid- and water-stable homogeneous catalysts for the hydrodeoxygenation of sugar-derivatives plotting temperature-stability vs catalyst generations synthesized and tested over the last 20 years.

*ii) Heterogeneous catalyst:* More recently the Schlaf Group has successfully branched out into the use of “off-the-shelf” heterogeneous catalysts (e.g., Ru/C or Pd/C) as a complementary approach, shifting the focus from catalyst design to substrate modification.

A second research interest is the remediation of bauxite residue (“Red Mud”), a highly alkaline (*p*H > 12) and toxic by-product of the Bayer process in the Aluminium industry produced at > 140 megatons/year (!) and stored at to date > 4 gigatons (!) in open lagoons. This representing an unresolved global environmental challenge, which we have proposed to overcome by neutralization of the Red Mud using acidic biomass derived pyrolysis bio-oil or HCl from PVC recycling as the source of acidity thus transforming the waste into high salinity (NaCl content) soil material that can then be revegetated by tolerant plants.

**Education**

**Ph.D. in Inorganic Chemistry**; University of Toronto.

August 1996.

Supervisor: Prof. Dr. Robert H. Morris

**Diplom-Chemiker**; Bayerische Julius-Maximilian Universität, Würzburg, Germany, March 1992.

Supervisor: Prof. Dr. Helmut Werner

**Professional Experience**

January 1999 to **Faculty at the University of Guelph, (tenured since 2003)**
present

March 2018 **Visiting Researcher
Los Alamos National Laboratory**, New Mexico, USA.

April 2015 to **Visiting Professor, Dalian Institute for Chemical Physics,** March 2019 **Chinese Academy of Sciences**

February 2006 to **Visiting Researcher**
June 2006 **Los Alamos National Laboratory**, New Mexico, USA.

October 1997 to **NSERC Postdoctoral Fellow, Research Associate.**
December 1998 **Brookhaven National Laboratory**, New York, USA.

• Application oriented project on catalytic biomass conversion to
chemical feedstocks in cooperation with DuPont.

October 1996 to **NSERC Postdoctoral Fellow**, **University of Ottawa.**
September 1997

• Various projects on the homogeneously catalyzed carbonylation of small molecules as potential pharmaceutical precursors.

April 1992 to **Graduate Student** in chemistry, Ph.D. thesis.
August 1996 **University of Toronto**, Toronto, Canada.

• Synthesized several new non-classical dihydrogen complexes of the iron group metals with an emphasis on the heterolytic activation of hydrogen gas for catalysis applications.

August 1995 **Visiting Researcher
Los Alamos National Laboratory**, New Mexico, USA.

• Conducted research on the activation of hydrogen-silicon bonds on transition metal centers.

March 1991 to **Graduate Student** in chemistry; Diploma thesis.
March 1992 **Bayerische Julius-Maximilian Universität**, Würzburg, Germany.

• Designed apparatus , standardized working procedures and developed software for kinetic studies on rhodium based homogeneous hydrogenation catalysts.

April to **Database Researcher**
October 1991 **Stürtz AG**, Würzburg, Germany

• Systematically researched international publications for chemistry related business and economic information for database profile development.

August to **Laboratory Technician**September 1990 **Knoll AG/BASF AG**, Ludwigshafen, Germany

• Analyzed pharmaceutical preparations for quality control and quality development.

April to **Research Assistant**
September1989 **Fraunhofer Institut für Silicatforschung**, Würzburg, Germany.

• Contributed to the development of fire resistant multi-layer gel windows for nuclear power stations.

June 1985 to **Military Service, West German Army**
October 1986

• Served in tactical support and telecommunications functions in joint US/German nuclear artillery battalion, 1. FArt.Btl. 121, 12, Art. Rgt., 12. Pz. Div., associated with the 3rd Artillery Detachment, 3rd US Infantry Division, US Army, Fulda Gap.

**Languages:** 100 % proficient in English & German in scientific, engineering, social, business, and military environments.
Working knowledge of French and Latin.

**Scholarships and Awards**

1988-1992 Recipient of a stipend from the Robert Bosch Foundation of the Robert Bosch GmbH, Stuttgart, Germany.

1992/93 University of Toronto Open Fellowship

1992 University of Toronto; F.A. Beamish Award in Inorganic Chemistry

1993/94 University of Toronto Open Fellowship

1994/95 Simcoe Special Fellowship

1995/96 University of Toronto Open Fellowship

1996 to 1998 NSERC Postdoctoral Fellow (Canadian citizen)

**Professional Societies**

Canadian Institute of Chemistry, Member

American Chemical Society, Member

ICSOBA Member

BioFuelNet Canada Member

Canadian Green Chemistry Network Member

Editorial Board Member *Chinese Journal of Catalysis*

**Research Interests**

* Transition Metal Catalyzed Transformations of Sugars and Sugar Alcohols
* Organometallic Chemistry: Design and Development of New Ionic Hydrogenation and Hydrogenolysis Catalysts
* Biomass Conversion: Controlled Catalytic Deoxygenation of Sugar Polyols to Fuels and Chemicals Using Homogeneous and Heterogeneous Hydrogenation and Hydrogenolysis Catalysts
* Remediation and utilization of Bauxite Residue (Red Mud)
* Fundamental and Policy Issues with Respect to Sustainable Systems

**Invited Lectures:**

June 2000
**Tripos Receptor Research, Bude, Cornwall, UK** “Transition Metal Catalyzed Transformations of Simple Monosaccharides - New Synthetic Methodology for Carbohydrate Chemistry”.

August 2000
**BAYER Rubber, Sarnia, Ontario, Canada**“Catalytic Ionic Hydrogenation Technology -
Challenges - Chemistry – Opportunities”

July 2002
**Gordon Research Conference on Organometallic Chemistry, Newport, RI, USA**
**“**Palladium Catalyzed Transfer Vinylations – Principle, Mechanism and Application to Synthetic Carbohydrate Chemistry.”

July 2004
**University of Waterloo
“**Transition Metal Catalyzed Transformations of Sugar Hydroxyl Functions”

May 2005
**Universität Stuttgart, Germany**"Transition Metal Catalyzed Transformations of Sugar Hydroxyl Functions"

May 2005

**Universität Würzburg, Germany**"Transition Metal Catalyzed Transformations of Sugar Hydroxyl Functions"

May 2005
**Ludwig-Maximilian-Universtität, Muenchen, Germany**"Transition Metal Catalyzed Transformations of Sugar Hydroxyl Functions"

July 2005
**Brookhaven National Laboratory, Long Island, NY**“Ionic Hydrogenation and Hydrogenolysis Reactions of Polyols – Some Crazy Ideas for New Approaches to Biomass Conversion.”

July 2005
**Gordon Research Conference on Organometallic Chemistry, Newport, RI,**“Ionic Hydrogenation and Hydrogenolysis Reactions of Polyols – Some Crazy Ideas for New Approaches to Biomass Conversion.”

December 2005
**Pacifichem 2005, Honolulu, HA**“New metal-ligand bifunctional catalysts for the ionic hydrogenation and hydrogenolysis of polyols to a,w-diols - Some ideas for new approaches to biomass conversion through the controlled oxygen content
reduction of sugars.”

April 2006
**New Mexico State University, Las Cruces, NM**“Selective Deoxygenation of Sugar Polyols to Polymer Precursors –
A New Challenge to Homogeneous Hydrogenation and Hydrogenolysis Catalysis.”

June 2006

**Los Alamos National Laboratory, Los Alamos, NM**
“Selective Deoxygenation of Sugar Polyols to Polymer Precursors –
Motivation, Opportunities, Challenges.”

March 2007
**ACS Meeting Chicago**
"New homogeneous catalysts for selective deoxygenations of sugar polyols to polymer precursors and fine chemicals – motivation, strategies, challenges and catalyst design."

September 2007
**14th Brazilian Catalysis Conference
Porto de Galinhas, Pernambuco, Brasil**
"New homogeneous catalysts for selective deoxygenations of sugar polyols to polymer precursors and fine chemicals – motivation, strategies, challenges and catalyst design."

November 2007
**Bioeconomy Outlook Conference
Iowa State University
Ames, Iowa**"New homogeneous catalysts for selective deoxygenations of sugar polyols to polymer precursors and fine chemicals – motivation, strategies, challenges and catalyst design."

June 2008
**University of Western Ontario, London, Ontario**

“Group 8 Metal Complexes as Homogeneous Ionic Hydrogenation and Hydrogenolysis Catalysts for the Deoxygenation of Biomass to Petrochemicals - Opportunities, Challenges, Strategies and the Story so far.”

August 2008
**ACS Meeting Philadelphia (by Invitation ConocoPhillips)**“Group 8 Metal Complexes as Homogeneous Ionic Hydrogenation and Hydrogenolysis Catalysts for the Deoxygenation of Biomass to Petrochemicals - Opportunities, Challenges, Strategies and the Story so far.”

October 2008
**CRC International Symposium on Bio-interface and Biomass Conversion
Catalysis Research Center (CRC), Hokkaido University, Japan
“**Group 8 Metal Complexes as Homogeneous Ionic Hydrogenation and Hydrogenolysis Catalysts for the Deoxygenation of Biomass to Petrochemicals - Opportunities, Challenges, Strategies and the Story so far.”

April/ May 2009
**Visiting Faculty**

**Peking University, Beijing China**

**Dalian University of Technology, Dalian, China**

**Dalian Institute for Chemical Physics, Dalian, China**

Series of 8 lectures on catalysis and biomass conversion.

April 2010
**Annual (GWC)2 Address, University of Waterloo**
“Transition-Metal Catalyzed Deoxygenation of Biomass to Petrochemicals and Fuels - Strategies, Challenges and Some Successes.”

July 2010

**The Center for Enabling New Technologies Through Catalysis (CENTC), a National Science Foundation Center for Chemical Innovation, University of Washington, Seattle, WA, USA (sponsored by ExxonMobil and Los Alamos National Laboratory)**

“Homogeneous and Heterogeneous Transition Metal Catalysis for the Selective Deoxygenation of Sugar Alcohols to Petrochemicals.”
“Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil.”

October 2010
**Université de Montreal, Montreal, QC**"Transition-Metal Catalyzed Deoxygenation of Biomass to Petrochemicals and Fuels - Strategies, Challenges and Some Successes"

**McGill University, Montreal, QC**
"Transition-Metal Catalyzed Deoxygenation of Biomass to Petrochemicals and Fuels - Strategies, Challenges and Some Successes"

December 2010
**Pacifichem 2010, Honolulu, HA**"Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil"

June 2011
**Rutgers University, NJ – NSF IGERTS Symposium**
"Upgrading of Pyrolysis Bio-Oil with Red Mud Catalyst”

July 2011
**Los Alamos National Laboratory, NM
LANSCE Neutron Summer School
“**Transition-Metal Catalyzed Deoxygenation of Biomass to Petrochemicals and Fuels - Strategies, Challenges and Some Successes”

August 2011
**ACS Meeting, Denver, CO**
“Water-, acid- and high-temperature stable ruthenium chelate complexes as catalysts for the deoxygenation of sugar-derived substrates.”

“Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil”

October 2012
**University of Patras, Greece**
**“**Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil”

March 2012
**University of Alberta – Advances in Sustainable Chemistry Symposium**
**“**Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil”

January 2012
**University of Western Ontario
“**Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil”

October 2012
**University of Patras, Greece**
**“**Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil”

May 2013
**CSC Meeting Quebec City**“Water-, acid- and high-temperature stable ruthenium pyridine-chelate aquo complexes as catalysts for the deoxygenation of sugar-derived substrates.”

September 2013
**Peking University
“**Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil”

**Tianjin University**

6 lectures on biomass conversion

**2nd International Congress on Catalysis for Biorefineries (CATBIOR)
Dalian Institute of Chemical Physics
“**Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil”and“Water-, acid- and high-temperature stable ruthenium pyridine-chelate aquo complexes as catalysts for the deoxygenation of sugar-derived substrates.”

October 2013
**Mount Allison University**
**“**Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil”

November 2013
**Ryerson University**
“Red Mud as a Catalyst for the Upgrading of Pyrolysis Bio-Oil”

July 2014
**19th International Symposium on Homogeneous Catalaysis, Ottawa, ON**
“Acid-, water, and high-temperature stable homogeneous catalysts for the hydrodexoygenation (HDO) of biomass derived substrates to diols, alkenes and alkanes.”

January 2015
**Western University, London, ON**
“How to design, make and test acid-, water- and high temperature-stable homogeneous catalysts for the hydrodeoxygenation of biomass derived sugars and sugar condensates to value-added alcohols, alkenes and alkanes.”

September 2015
**3rd International Congress on Catalysis for Biorefineries (CATBIOR)
Rio de Janeiro, Brazil**"Acid-, Water- And High-temperature-stable Homogeneous Catalysts For The Hydrodeoxygenation Of Biomass Derived Sugar Condensates To Value-added Diols, Ethers And Alkanes."

October 2015
**Bauxite Residue Valorisation and Best Practices, KU Leuven, Belgium**
"Synergistic Co-Processing of Red Mud with Pyrolysis Bio-Oil: From Neutralization to Catalysis."

December 2015
**Pacifichem 2015, Honolulu, Hawai'i**"Synergistic Co-Processing of Red Mud with Pyrolysis Bio-Oil: From Neutralization to Catalysis"
"Acid-, water- and high temperature-stable homogeneous catalysts for the hydrodeoxygenation of biomass derived sugars and sugar condensates to value-added alcohols, alkenes and alkanes."

June 2016
**CSC 2016, Halifax, N.S.**
"Acid-, Water- And High-temperature-stable Homogeneous Catalysts For The Hydrodeoxygenation Of Biomass Derived Sugar Condensates To Value-added Diols,
Ethers And Alkanes."

November 2016
**Brock University, St. Catherines, ON**
"Acid-, Water- And High-temperature-stable Homogeneous Catalysts For The Hydrodeoxygenation Of Biomass Derived Sugar Condensates To Value-added Diols,
Ethers And Alkanes."

March 2017
**University of Waterloo**
"Acid-, Water- And High-temperature-stable Homogeneous Catalysts For The Hydrodeoxygenation Of Biomass Derived Sugar Condensates To Value-added Diols,Ethers And Alkanes."

May 2017
**CSC 2017, Toronto, ON**
“Homogeneous catalyst systems for the hydrodeoxygenation of sugar-derived substrates. Insights into the principles, opportunities and challenges of catalyst design.”

July 2017
**Organometallic Gordon Conference**
Newport, RI, USA
"Hydrodeoxygenation of Biomass Derived Sugars and Sugar Condensates into Value Added Chemicals and Fuels. (Insights into the principles, opportunities and challenges of homogeneous catalyst design.)"

December 2017
**4th International Congress on Catalysis for Biorefineries (CATBIOR)**,**Lyon, France**
“[Ru(triphos)(CH3CN)3](OTf)2 as a homogeneous catalyst for the hydrogenation of biomass derived 2,5-hexanedione and 2,5-dimethylfuran in aqueous acidic medium.

December 2017
**Bayerische Julius-Maximilian Universität**, **Würzburg, Germany.**“Homogeneous catalyst systems for the hydrodeoxygenation of sugar-derived substrates. Insights into the principles, opportunities and challenges of catalyst design.”

March 2018
**Los Alamos National Laboratory, NM, USA**“Homogeneous catalyst systems for the hydrodeoxygenation (HDO) of sugar-derived substrates. Insights into the principles, opportunities and challenges of catalyst design.”

May 2018
**2nd Bauxite Residue Valorisation and Best Practices,** **Athens, Greece.**
“Looking for acidity – or – the case of the missing chlorine: an option for a global closed loop alkalinity-acidity cycle for bauxite residue neutralization.”

September 2019
**CatBior 2019, Turku, Finland**“Are sugar alcohols or furanics the better starting point for hydrodeoxygenation to high-value chemicals ?”

**Contributed Presentations**

May 2000 **CSC2000 Meeting, Calgary, AB**
“Ruthenium, palladium, rhodium, and iridium catalyzed silane alcoholysis in a highly polar solvent - detailed reinvestigation of the RuwClx(CO)y(PMe3)z catalyst system.”

May 2001 **CSC2001 Meeting, Montreal, QC**
“Palladium Catalyzed Transfervinylations of Simple Monosaccharides”

June 2002 **CSC2002 Meeting, Vancouver, BC
“**Regioselective Silylation of Sugars through Palladium Nano Particle Catalyzed Silane Alcoholysis.”

July 2002 **Gordon Research Conference on Organometallics, Newport, RI**
"Palladium Catalyzed Transfer Vinylations – Principle, Mechanism and Application to Synthetic Carbohydrate Chemistry"

May 2004 **18th Canadian Symposium on Catalysis, Montreal, QC**
"Approaches to the Catalytic Ionic Hydrogenation and Hydrogenolysis of Carbohydrate Polyols to ω,α-Diols."

May 2008 **CSC Meeting, Edmonton, AB**
“Organometallic Group 8 Metal Complexes as Homogeneous Ionic Hydrogenation and Hydrogenolysis Catalysts for the Deoxygenation of Biomass to Petrochemicals – Opportunities, Challenges, Strategies and the Story so far… “

June 2009 **CSC Meeting, Hamilton, ON**
**“**Total Catalytic Deoxygenation of Glycerol by the Acid-, Water- and Thermally Stable Ruthenium Complexes [Ru(R-terpy)(H2O)3](OTf)2, R = H, 4’-Ph.”

October 2018
**68th Canadian Chemical Engineering Conference, Toronto, Canada.**
“Furanics or Sugar Alcohols ? Opportunities and challenges in the
hetero- vs homogeneously catalyzed hydrodeoxygenation of sugar derivatives.”

and

“Looking for acidity – or – the case of the missing chlorine: an option for a global closed loop alkalinity-acidity cycle for bauxite residue neutralization.”

**Patents**

1) “Dehydroxylation of Diols and Polyols”.
WO 0198241 (**2001**). Inventors: **Marcel Schlaf**, R. Morris Bullock, Paul J. Fagan, E. Hauptman. Patent Assignee: BNL, The DuPont Company

2) “Catalytic Reduction of Ketones and Aldehydes Using Organometallic Ruthenium Complexes.”
WO 0198238 (**2001**). Inventors: **Marcel Schlaf**, R. Morris Bullock, Paul J. Fagan, E. Hauptman. Patent Assignee: BNL, The DuPont Company

3) “Process for the total Deoxygenation of Sugar Alcohols and their Dehydration Derivatives or Levulinic Acid to Alkenes and Alkanes.” WO2013040311A1, **2013**.
Inventors: Gordon, J. C.; Silks, L. A.; Sutton, A. D.; Wu, R.; **Schlaf, M.**; Waldie, F.; West, R.; Collias, D. I. Compounds and methods for the production of long chain hydrocarbons from biological sources. Patent Assignee: LANL

**Publications**

**Books**

**Reaction Pathways and Mechanisms in Thermocatalytic Biomass Conversion Volume I:**
Cellulose Structure, Depolymerization and Conversion by Heterogeneous Catalysts Editors: **Marcel Schlaf**, Z. Conrad Zhang, Springer 2015, ISBN: 978-981-287-687-4 (Print) [978-981-287-688-1 (Online)](http://link.springer.com/book/10.1007/978-981-287-688-1)

**Reaction Pathways and Mechanisms in Thermocatalytic Biomass Conversion Volume II:**
Homogeneously Catalyzed Transformations, Acrylics from Biomass, Theoretical Aspects, Lignin Valorization and Pyrolysis Pathways Editors: **Schlaf, Marcel**, Zhang, Z. Conrad (Eds.)
Springer 2015, [ISBN 978-981-287-769-7](http://www.springer.com/us/book/9789812877680)

**Refereed Papers**

53) *By invitation:*Elise M.-J. Banz Chung, Maryanne K. Stones, Elnaz Latifi, Cameron Moore, Andrew D. Sutton, Gary Umphrey, Dmitriy V. Soldatov, and Marcel Schlaf.
“Ruthenium triphos complexes [Ru(X(CH2PPh2)3-κ3-P)(NCCH3)](OTf)2; X = H3C-C , N) as catalysts for the conversion of furfuryl acetate to 1,4-pentanediol and cyclopentanol in aqueous medium.” *Can. J. Chem.*, **2020**, accepted for publication. Celebratory issue in honour of Prof. Robert Morris.

52) Maryanne K. Stones, Elise M.-J. Banz Chung, Igor Tadeu da Cunha, Ryan J. Sullivan,Parnian Soltanipanah, Megan Magee, Gary J. Umphrey, Cameron M. Moore, Andrew D. Sutton and Marcel Schlaf.
“Conversion of Furfural Derivatives to 1,4-Pentanediol and Cyclopentanol in Aqueous Medium Catalyzed by trans-[(2,9-Dipyridyl-1,10-phenanthroline)(CH3CN)2Ru](OTf)2.”
*ACS Catalysis*, **2020**, *10*, 2667-2683.

51) Maryanne K.Stones, Ryan J.Sullivan, Dmitriy V. Soldatov and Marcel Schlaf
“Synthesis and characterization of novel tetradentate ruthenium complexes of a pyridine-*o*-phenylenediamine based chelate ligand.”
*Inorganica Chimica Acta*, **2020**, *502*, 119391. https://doi.org/10.1016/j.ica.2019.119391.

50) McClenaghan, B.; Schlaf, M.; Geddes, M.; Mazza, J.; Pitman, G.; McCallum, K.; Rawluk, S.; Hand, K.; Otis, G. W.,
"Behavioral responses of honey bees, Apis cerana and Apis mellifera, to Vespa mandarinia marking and alarm pheromones."
*Journal of Apicultural Research* **2018**, 1-8.

49) Marcel Schlaf
“Looking for acidity - or - the case of the missing chlorine: an option for a global closed loop alkalinity-acidity cycle for bauxite residue neutralization.”
Refereed Conference Paper for the "2nd Bauxite Residue Valorisation and Best Practices", Athens, Greece, 7-10/05/2018.

and

“Searching for acidity - or - the case of the missing chlorine: An option for a global closed loop alkalinity-acidity cycle for bauxite residue neutralization based on HCl from PVC recycling.”
*Journal of Sustainable Metallurgy*, **2018**, https://doi.org/10.1007/s40831-018-0193-1

48) Elnaz Latifi, Austin D. Marchese, Margaret C.W. Hulls, Dmitriy V. Soldatov and Marcel Schlaf
“[Ru(triphos)(CH3CN)3](OTf)2 as a homogeneous catalyst for the hydrogenation of biomass derived 2,5-hexanedione and 2,5-dimethyl-furan in aqueous acidic medium.”
*Green Chemistry*, **2017**, 19, 4666-4679.

47) *By invitation:*
Ryan Sullivan, Jin Kim, Caroline Hoyt, Louis A. (Pete) Silks III and Marcel Schlaf
"Ruthenium-8-Quinolinethiolate-Phenylterpyridine vs Ruthenium-Bipyridine-Phenyl-terpyridine Complexes as Homogeneous Water and High Temperature Stable Hydrogenation Catalysts for Biomass-Derived Substrates"
*Polyhedron*, **2015**, Special Issue: "Inorganic Chemistry in Canada", *108*, 104-114.

46) *By invitation:*
Thomas A. Minard, Christopher T. Oswin, Fraser D.C. Waldie, Jennifer K. Howell, Benjamin M.T. Scott, Domenico Di Mondo, Ryan J. Sullivan, Benjamin Stein, Michael Jennings and Marcel Schlaf
"In situ generation of water-stable and -soluble ruthenium complexes of pyridine-based chelate-ligands and their use for the hydrodeoxygenation of biomass-related substrates in aqueous acidic medium."
*J. Mol. Catal. A: Chem.,* **2015** - Special Issue/Collection in honour of Prof. Ulf Schuchardt’s 70th birthday: “Catalysis for Biorefining”, **422**, 175-187.

45) Marcel Schlaf, Elham Karimi, Véronique Joillet and Christopher F.G. Gissane
"Synergistic Co-Processing of Red Mud with Pyrolysis Bio-Oil: From Neutralization to Catalysis."
Refereed Conference Paper for "Bauxite Residue Valorisation and Best Practices", KU Leuven, Belgium, 5-7/10/2015. Proceedings published in book form: ISBN 9789460189784.

44) Ryan Sullivan, Enaz Latifi, Benjamin K.-M. Chung, Dmitriy Soldatov, Marcel Schlaf
"Hydrodeoxygenation of 2,5-hexanedione and 2,5-dimethylfuran by water-, air- and acid-stable homogeneous ruthenium and iridium catalysts."
*ACS Catalysis*, **2014**, *4,* 4116-4128.

43) Eliane Cristina de Resende, Iara do Rosário Guimarães Carvalho, Marcel Schlaf and Mário César Guerreiro.
"Red Mud Water from the Bayer Process as a Catalyst for the Desulfurizaiton of Hydrocarbon Fuels.” *RSC Advances*, **2014**, **4**, 47287-47296.

42) Véronique Jollet, Christopher Gissane and Marcel Schlaf
"Optimization of the neutralization of Red Mud by pyrolysis bio-oil using a design of experiments approach." *Energy Environ. Sci.*, **2014**, *7*, 1125-1133.

41) Domenico DiMondo , Michelle E. Thibault , James Britten , and Marcel Schlaf
“Comparison of the Catalytic Activity of [(η5-C5H5)Ru(2,2′-bipyridine)(L)]OTf versus [(η5-C5H5)Ru(6,6′-diamino-2,2′-bipyridine)(L)]OTf (L = labile ligand) in the Hydrogenation of Cyclohexanone. Evidence for the Presence of a Metal–Ligand Bifunctional Mechanism under Acidic Conditions.” Organometallics, **2013**, 32, 6541–6554.

40) Andrew D. Sutton, Fraser D. Waldie, Ruilian Wu, Marcel Schlaf, Louis A. “Pete” Silks III, John C. Gordon
"The Hydrodeoxygenation of Bioderived Furans into Alkanes."
*Nature Chemistry* **2013**, *5*, 428.

39) Elham Karimi, Ivo Freitas Teixeira, Ariel Gomez, Eliane de Resende, Christopher Gissane, Jay Leitch, Véronique Jollet, Isabella Aigner, Franco Berruti, Cedric Briens, Peter Fransham, Brent Hoff, Nick Schrier, Rochel M. Lago, Stefan W. Kycia, Richard Heck, and Marcel Schlaf
"Synergistic co-processing of an acidic hardwood derived pyrolysis bio-oil with alkaline Red Mud bauxite mining waste as a sacrificial upgrading catalyst. "
*Applied Catalysis B: Environmental*, *B,* **2014***, 145,* 187–196*.*

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**Training of HQP**

In the last 6 years:

|  |  |
| --- | --- |
| Ph.D. Students supervised/graduated | 4 |
| M.Sc. Students supervised/graduated | 7 |
| Undergraduate Research Students | 16 |
| Postdoctoral Fellows | 1 |
| Visiting Faculty/Researchers | 2 |

**Present research group as of Oct 2020:**

1 Ph.D. students (Gabriel Hart Slater-Eddy)

3 M.Sc,.students (Aidan England, Elise Chung, Kyle Salmon)

**Funding History** (past 10 years – in CAN$)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Proposal Title** | **Funding Source/****Program Name** | **Amount p.a.** | **From**  | **To** | **Total Amount** |
| Iron-Based Catalysts for the Hydrogenation and Hydrogenolysis Upgrading of Lignin Derived Pyrolysis Bio-Oil to Piston and Turbine Engine-Usable Fuels. | Agricultural Bioproducts Innovation Network (ABIN);(joint with Profs. Franco Berruti and Cedric Briens, UWO) | 66,000 $ | 2008 | 2010 | 198,000 $ |
| Homogeneous Ionic Hydrogenation and Hydrogenolysis Catalysts for the Selective Deoxygenation of Sugar Polyalcohols and Lignins | NSERCDiscovery | 41,000 $ | 2008 | 2012 | 205,000 $ |
| New Homogeneous and Nano Particle Catalysts for the Total Hydrogenation of Seed Oils to 2nd Generation Bio-Diesel | OMAFRAFPInnovationsPAPRICANAlternative Fuels  | 66,000 $ | 2008 | 2010 | 198,000 $ |
| New ionic hydrogenation and hydrogenolysis catalysts for the deoxygenation of renewable sugar polyols and lignins to alpha, omega-diols and phenolics as polymer components | NSERCBioCap FoundationDuPont | 95,000 $ | 2007 | 2009 | 285,000 $ |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Direct Synthesis of 1,3-propane diol from Glycerol Using Transition Metal Based Ionic Hydrogenation Catalysts | OMAFRANatural Resources CanadaBioCap FoundationAlternative Fuels | 38,000 $ | 2005 | 2007 | 114,000 $ |
| Transition Metal catalyzed sugar transformations | NSERCDiscovery | 38,000 $ | 2003 | 2007 | 190,000 $ |
| High-Energy Density Fuel from Biomass Derived Molecules | Los Alamos National Laboratory, LDRD program | 50,000 US$ | 2010 | 2012 | 150,000 $ |
| Acid-, Water-, and High-temperature Stable Homogeneous and Heterogeneous Catalysts for the Deoxygenation of C4-C6 Sugars to Alcohols, Alkenes and Alkanes. | OMAFRA | 65,000 $60,000 $60,000 $ | 2010 | 2013 | 185,000 $ |
| Elemental Analyzer | Rio Tinto ALCAN | 50,000 $ | 2011 |  |  |
| High-pressure hydrogenation lab | CFI/MEDI/UofG | 524,340 $ | 2012 |  | 524,340 $ |
| NCE Bio Fuel Network Canada | NSERC/Rio Tinto ALCAN/UofG | 110,415 $ | 2012 | 2015 | 331,250 $ |
| NSERC Operating | Catalytic deoxygenation of biomass derived polyalcohols using acid-,water- and high-temperature stable Ruthenium complexes. | 44,000 | 2013 | 2017 | 220,000 $ |
| NCE Bio Fuel Network Canada – Phase II | NSERC | 32,500 | 2015 | 2017 | 65,000 $ |
| OMAFRA Bioeconomy | OMAFRA | 61,908 | 2014 | 2017 | **185,724 $** |
| NSERC Operating | NSERC Discovery | 36,000 | 2018 | 2023 | 180,000 $ |
| **Total** |   |   |   |   | **$3,021,314.00** |

 **Recent and Current Committees and Service**

Graduate Coordinator for the Department of Chemistry

(GWC)2 Coordinating Committee (*ex officio* as Graduate Coordinator)

(GWC)2 Recruiting Committee (*ex officio* as Graduate Coordinator)

CEPS Graduate Awards Committee (*ex officio* as Graduate Coordinator)

Department Chemistry Hiring Committee: Materials Chemistry, Crystallography

UofG Senate for representative for CPES/Department of Chemistry (to 2017)

UofG Senate Research Board (to 2017)

UofG Strategic Renewal Advisory Board (2016)

UofG Graduate Awards Committee (*ex officio* as Graduate Coordinator)

>10 Graduate Student Advisory Committees

Departmental Tenure and Promotion Committee

**Gentlemanly Endeavours and Community Involvement**

2007 Vice-Commodore, Guelph Community Boating Club

2008 Commodore, Guelph Community Boating Club

2009 Commodore, Guelph Community Boating Club

2010 Treasurer Guelph Community Boating Club

2010 Board of Directors Guelph Lake Boating Incorporated

2011 Treasurer Guelph Community Boating Club

2011 Board of Directors Guelph Lake Boating Incorporated

2012 Commodore, Guelph Community Boating Club

2013 Commodore, Guelph Community Boating Club

2014- Past-Commodore and Security Manager, Guelph Community
2015 Boating Club

2014- Guelph Rod and Gun Club – Certified Range Safety Officer
present

2015- Vice-Commodore and Security Manager, Guelph Community Boating
2016 Club

2016- Commodore, Guelph Community Boating Club
2017

2017- Past-Commodore and Security Manager, Guelph Community Boating
2018 Club

2018- Past-Commodore and Security Manager, Guelph Community Boating
present Club

**Interests**

Sailing, target shooting, yoga, Pilates, swimming, biking/hiking, reading.