Chadron MARK Friesen, Ph.D.

**Home Address**  **Business Address**

21101 92B Avenue Trinity Western University

Langley, British Columbia V1M 2B2 Department of Chemistry

 Neufeld Science Centre

 7600 Glover Road

 Langley, B.C. V2Y 1Y1

 Canada

 PH: (604) 513-2121 (#3220)

FAX: (604) 513-2018

E-mail:chad.friesen@twu.ca

**EDUCATION:**

**Ph.D. in Chemistry,** May 2000

*The University of Alabama, Tuscaloosa, AL, 35487 USA*

Dissertation: Perfluoropolyalkylethers (PFPAE): *The Synthesis and Characterization of Lubricant Derivatives for New Industrial Applications and Improvements in Thermal Oxidative Environments.*

Research Advisor: Joseph S. Thrasher, Ph.D.

**Major:** Analytical**; Minor:** Organic **G.P.A. 3.45/4.00**

**Specialty: Organofluorine Chemistry**

**B.S. Degree in Chemistry,** December 1995

**B.S.E Degree in Chemistry,** December 1995

*John Brown University, Siloam Springs, AR, 72761USA*

**Magnum Cum Laude, G.P.A.: 3.78/4.00**

**RECOGNITIONS:**

* Air Force Research Lab Summer Faculty Fellowship (2020)
* Executive Member, American Chemical Society Division of Fluorine Chemistry (2018-2020)
* Nominated for the Davis Distinguished Teaching Award (2018)
* Past Chair, American Chemical Society Division of Fluorine Chemistry (2014)
* Chaire Total Fondation Balard (2014)
* Chair, American Chemical Society Division of Fluorine Chemistry (2013)
* Vice-Chair/Secretary, American Chemical Society Division of Fluorine Chemistry (December 2009-2012)
* Trinity Western University Research Fellowship (2005)
* The University of Alabama Graduate Council Research Fellowship (1999)

**CHEMISTRY EXPERIENCE:**

**Professor of Chemistry** (August 2010-present)

**Associate Professor of Chemistry** (August 2005-2010)

**Assistant Professor of Chemistry** (August 2000-2005)

*Department of Chemistry, Trinity Western University, Langley, BC, V2Y 1Y1 Canada.*

* Teach courses in General, Analytical, Organic, Advanced Organic, Fluorine, and Physical(Thermodynamics) Chemistry
* Operate and manage a research program
* Advise/Advised Undergraduate Thesis Students (54) and Graduate Students (9) in their Research
* Current Research:
* Novel methods of fluorination using silver (I) fluoride
* Polymerization of fluorinated epoxides for applications in photo-cured microfluidic devices and lithium ion batteries
* Functionalization of perfluoropolyalkylethers and its application in theranostics for monitoring chronic pain
* Formation of ammonium based salts from hydrofluoroethers for application in anionic polymerization reactions and RFO-transfer agents
* Co-Chair of the Department of Chemistry (2019-current)
* University’s Academic Research Council (2019-current)
* Faculty Affairs Executive and Faculty Work Environment Committee (2015-2018)
* Acted as chair for the chemistry department when needed (August 2005-2006), (Assistant Chair August 2009-2012, Co-Chair-2019-present)
* University Senator (Fall 2008-2010)
* Offer my consulting services to the local community ranging from product development to scale-up
* Involved in Projects or Committees that Focus on the Affairs of Faculty, Research, and Intellectual Property Policy at the University

**Chair Total Fondation Balard & Visiting Scientist** (September 2013-July 2014)

*Ingénierie et Architectures Macromoléculaires, Institut Charles Gerhardt - UMR(CNRS) 5253, Ecole Nationale Supérieure de Chimie de Montpellier, 8  Rue de l'Ecole Normale, F-34296 Montpellier Cedex (France)*

* Supervise graduate students in research projects associated with the use of perfluoropolyalkylethers and high pressure reactions
* Provide lectures/work-shops to Master’s students and research scientist on fluorine chemistry and how to utilize or use fluorinated ethers
* Completed a Chemical Review paper on The Functionalization of Perfluoropolyalkylethers

**Adjunct Professor of Chemistry** (November 2004-present)

*Department of Chemistry, Simon Fraser University, 8888 University Drive, Burnaby, B.C.*

*V5A 1S6, Canada*

* Advise Master’s and Doctoral students who collaborate with Trinity Western University on their research projects
* Provide Fluorine Expertise and consulting to the Chemistry Department

**Visiting Scientist** (September 2006-August 2007 and April –June 2001)

E.I. du Pont de Nemours and Co., Inc., Jackson Laboratory, Chambers Works, Deepwater, NJ, 08023 USA. and Experimental Station, Wilmington, DE 19080, USA

* Polymerization and Identification of New Perfluoropolyalkylethers
* Synthesized new functional materials for the Krytox® business
* Wrote or Contributed to Patent and Technical Reports
* Assisted in the Guidance of CO-OP students

**Graduate Council Research Fellow** (August 1999-July 2000)

Department of Chemistry, The University of Alabama, Tuscaloosa, AL, 35487 USA

* Conducted Direct Fluorination of Polyalkylethers
* Worked on Synthetic Methodology for Perfluoropolyalkylether Aryl Phosphines
* Studied Fluorous Biphase Catalysis and Separations in Hydroformylation
* NMR & MS techniques for Characterization of Perfluoropolyalkylether Derivatives

**DuPont R&D Chemist, Limited Service Employee** (June 1998-May 1999)

E.I. du Pont de Nemours and Co., Inc., Jackson Laboratory, Chambers Works, Deepwater, NJ, 08023 USA.

* Developed New Perfluoropolyalkylethers Intermediates for high Temperature Stability and Anti-Corrosion Additives
* Synthesized Organofluorine Monomers for a New Family of Perfluorinated Oils
* Installed and Developed methods for Hewlett Packard GC-FID 6890’s for Jackson lab’s Research Analytical Services
* Provided Analytical Support and Installation of GC-FIDs for Krytox® Production Quality Control

**Graduate Research Assistant** (August 1996- May 1998)

Department of Chemistry, The University of Alabama, Tuscaloosa, AL, 35487 USA

* Operated and maintained a GC/MS (HP 5890 Series II Gas Chromatograph – HP 5971 Series Mass Selective Detector) and Thermal Gravimetric Analyzer (Cahn 1100 Instrument/Pressure Balance)
* Developed Methods and Established Analytical Techniques Employing GC/MS, FT-IR, and TGA
* Prepared and Handled Moisture Sensitive Materials via Vacuum line Techniques and High Pressure Autoclaves
* Gained Experience in Synthetic methods and Characterization in Organofluorine Chemistry (UV, FT-IR, TGA, GC/MS, AA, IC, NMR)

**Graduate Teaching Assistant** (June-August 1996)

Department of Chemistry, The University of Alabama, Tuscaloosa, AL, 35487 USA

* Instructed General Chemistry Labs
* Developed Teaching Materials
* Guided Students Through Difficult Tasks in the Laboratory
* Created a Friendly Environment for Learning

**SIGNIFicant Contributions:**

**1. Development of** **high temperature aerospace lubrication (jet engines)**. Prof. Dr. Friesen specifically studied the degradation pathway of poly(hexafluoropropylene oxide) [polyHFPO, a perfluoropolyalkylether] in harsh, high temperature and metal surface conditions leading to a large advancement in fluoropolymer lubricant technology. He discovered that the stability of the lubricant is not only based upon the back-bone of the chemical structure but also on the design of the terminus ends of the fluorinated lubricant. The characterization of terminus ends of perfluoropolyalkylethers (PFPAEs) was communicated publically in the *Journal of Fluorine Chemistry* in 1998 titled “Reactions of Poly-Hexafluoropropylene Oxide Acids and Their Corresponding Salts.” By understanding the weaknesses of the lubricant, degradation of the same lubricant could be hindered by building protective “shields” on the ends of the lubricant’s architecture. The new end-group or “shield” allows the PFPAE to survive temperatures that are 50o C hotter than previous materials. Prof. Dr. Friesen and his colleague’s work on thermal stable PFPAEs became a world patent in 2002 (“Thermally Stable Perfluoropolyethers And Processes Therefore and Therewith.” *World Intellectual Property Organization*, WO 0206375/ A2, **2002)** and a process patent in 2004 (“Thermally Stable Perfluoropolyethers And Processes Therefore and Therewith.” U.S. Pat. 6,753,301 B2, June 22, **2004**). The detailed decomposition mechanism of the new material was eventually published in “Improved Thermal Stability of Perfluoropolyalkylethers (PFPAEs).” *Journal of Synthetic Lubrication* **2007**, 24(4), 227-234. It is the highest temperature performing PFPAE on the market to date at 450o C (Krytox® XT).

**2. Perfluoropolyether primary iodides and bromides: used to make high temperature, anti-corrosion, oil/water repellent, stain resistant coatings, and fluorosurfactants to replace bioaccumlative perfluorooctanoic acid (PFOA).** Prof. Dr. Friesen greatly advanced the area of functionalized perfluoropolyalkylether fluids with a one-step process to create novel poly(hexafluoropropylene oxide)HFPO primary iodides known in the market today as Krytox® Primary Iodide. These iodides created a central hub in which many products can be formed. One example of a product generated from the iodides is new anticorrosion additives for metal machinery that had long term exposure to saline. A second example was new high temperature additives to enhance the protection of jet engine lubricants. This work was patented in 2006 because of its vast synthetic utility (“Perfluoropolyether primary bromides and iodides.” U.S. Pat. 6,653,511 B2, Nov 25, **2003**; “Contacting perfluoropolyether acid fluoride moiety with a metal bromide or iodide or polyether secondary iodide under conditions sufficient to produce perfluoropolyether containing at least one primary bromide or iodide.” US7148385 B2, December 12, **2006**; and “The Preparation of Primary Poly-Hexafluoropropylene Oxide Halides (Poly-HFPO-CF2X where X = I, Br, Cl and F).” *Journal of Fluorine Chemistry,* **2004,** *125(10),*1513-1518**.**) Prof. Dr. Friesen’s synthesis was also a route to replace certain Teflon®-based materials. In 2008, his technology was used by industry to aid in coating hard surfaces such as ceramics or glass, to render them water, oil, stain, and​/or dirt repellent.

World-wide research has shown perfluorooctanoic acid (PFOA) to be an environmental issue. Our research team looked for a surfactant that is degradable in the environment and would have better surface tension measurements than PFOA or its salt (ammonium perfluorooctanoate, APFO). John P. Giesy, current Professor and Canada Research Chair in Environmental Toxicology, discovered PFOA in many wildlife in Canada, including the polar bear and ringed seals. He had suggested that two fluorocarbons between ethers would be more degradable. By combining the water solubility of oligo(ethylene oxide) with the fluoro properties of poly(hexafluoropropylene oxide) primary iodide, Friesen’s research team was able to achieve critical micelle concentration of 0.04 g/L which is 10X better than PFOA (a surface tension measurement). Currently, French corporation is requesting the new surfactant to replace PFOA for the polymerization of tetafluroethylene (TFE). The surfactant requires the use of the Krytox® Primary Iodide which is sold today by The Chemours Company FC, LLC., a subsidiary of E. I. du Pont de Nemours and Company.

**3. Fluorinated torque lubricants from inexpensive starting materials.** These new perfluoropolyalkylethers (PFPAEs) could be directly applied to reducing torque for extreme cold engine start-ups (i.e. crank-case) and spinning hard disk-drives for computers and flight recorders (blackbox). Friesen was able to make the first useful partially fluorinated starting material for polymerization. He also spent considerable time working on methods to convert the final polymer containing some hydrocarbon into a completely fluorinated PFPAE using direct fluorination methods. This work on linear PFPAEs was published in *Lubrication Science* **2011**, *23*, 61-80 and titled “Synthesis of New Linear Perfluoroalkyl Polyethers Starting from Diols and Tetrafluoroethylene.”

**4. Development of biphasic nanoemulsion systems for diagnostic and therapeutic drug delivery and recycling catalytic metals.** Friesen’s research group and co-worker also pioneered biphase nanoemulsion systems (separable nano-reactors) utilizing perfluoropolyalkylethers (PFPAEs). There were two major research programs that were developed using nanoemulsions based on PFPAEs. First, was the incorporation of PFPAEs into common industrial catalysts. This work was initially funded by NSERC Discovery Grant in 2006 and the outcome of the work was reported by Friesen and co-workers in 2012. The greatest importance of this work was to demonstrate that costly precious metal catalysts, used to make any commercial product, could be separated and recycled repeatedly from the final product without using large amounts of energy or threatening human health (Green Chemistry). Additional benefits of using PFPAEs in biphase nanoemulson can be realized in new fluorous ionic liquids for biomass fuel conversion, and micro-droplets to increase reaction efficiencies, ease of scale-up, and to reduce the amount of solvents used.

The second research program exploiting PFPAEs in biphase nanoemulsions was the development of diagnostic and therapeutic drug delivery devices called theranostics. In 2013, Friesen began collaborating with a pharmacy research group in the USA and Australia to develop PFPAE-based theranostics systems for monitoring and reducing chronic pain and cancer. In the same year the USA research collaboration was formed, they published their discoveries in the *Journal of Fluorine Chemistry,* 2014*, 162*, 38 on theranostic nanoemulsions using PFPAE diblock surfactants. The PFPAE-based device that Friesen’s research group created showed the smallest nanoemulsions ever reported with PFPAEs with a droplet size of 85 nm. In addition, the nanoemulsions showed remarkable stability upon storage at elevated temperatures and when exposed to stress for up to 28 days at 37o C. These initial results show great promise for a theranostic drug-delivery-device. There is continued work in this area, which includes animal studies.

**5. Perfluorinated alkoxides: the key building block simplifying these previously mentioned processes and new polymerization initiators.** In 2013, Friesen and his research team broke new ground in finding a practical and harmless route to the synthesis and the use of fully fluorinated nonmetal-based alkoxides, known as perfluoroalkoxides (PFA). His research in cooperation with industry was filed in 2014 as a world patent (“Quarternary ammonium perfluoroalkoxy salts for preparation of perfluoropolyethers” PCT Int. Appl.  WO2014110329 A1, July 17, 2014). There have been no advancements in this field since the 1960s. The impact of this work is tremendous. PFAs form specific fluoropolymers with increased uniformity and controlled chain length. With this exacting control, new functional materials can be made for direct applications in surfactants, theranostic medicine, and metal catalyst recycling. With his continued research, PFAs have the potential to be attached to transition metals for use in the semiconductor (photovoltaics and integrated circuits) and petroleum reformation industry (high octane fuels from low), and the polymerization of natural plant products to make bio-polymers. In addition, by exploring new methodology, these PFAs can be incorporated into advanced lipophilic drugs. Friesen and his graduate student (Benson Jelier) recently collaborated with Harvard (Dr. Tobias Ritter) in exploring new methods in late-stage fluorination of pharmaceutical drugs using their discovery PFAs.

**Peer Reviewed Journals:**

**Note: bolded names are highly qualified personnel (HQP, trained students in research)**

1. **Giuseppe Trusiano**, Alessandra Vitale, **Céline Bonneaud**, Diego Pugliese, Sara Dalle Vacche, Christine Joly-Duhamel, Chadron M. Friesen, Roberta Bongiovanni “Vinyl ethers and epoxides photoinduced copolymerization with perfluoropolyalkylether monomers.” *Colloid and Polymer Science*, submitted May 2020
2. **Josiah J. Newton**, Benson J. Jelier, Michael Meanwell, Rainer E. Martin, Robert Britton and Chadron M. Friesen“Quaternary Ammonium Trifluoromethoxide Salts as Stable Sources of Nucleophilic OCF3.” *Organic Letters* **2020 (**DOI: 10.1021/acs.orglett.0c00099).
3. **Céline Bonneaud, Julia Burgess,** Alessandra Vitale, **Giuseppe Trusiano**, Christine Joly-Duhamel, Chadron M. Friesen and Roberta Bongiovanni “New perfluoropolyether maleimides for protection from oxygen inhibition and surface modification of UV-cured polymers.” *Frontiers in Materials* **2020**, *6*, 346 (DOI: 10.3389/fmats.2019.00346).
4. **Trevor J. Burgess**, Alessandra Vitale, Christine Joly-Duhamel, Roberta Bongiovanni, Abdelatif Manseri,Taizo Ono, Bruno Améduri and Chadron M. Friesen **“Synthesis of poly[oligo(hexafluoropropylene oxide) perfluoroisopropenylether (PIPE)] graft copolymers with vinylidene fluoride (VDF) using CF3 radicals.”** *Polymer Chemistry***2019,** **10,** 6651-6661 (DOI: 10.1039/C9PY01453E).
5. **Giuseppe Trusiano**, Alessandra Vitale, **Melania Rizzello, Céline Bonneaud**, Christine Joly-Duhamel, Chadron Friesen, Roberta Bongiovanni “Controlling perfluoropolyalkylether rearrangements at the surface of photocured networks.” *European Polymer Journal* **2019**, *12*, 109285. (DOI: 10.1016/j.eurpolymj.2019.109285).
6. **Josiah Newton, Daniel Driedger**, Matthew B. Nodwell,Paul Schaffer,Rainer E. Martin,Robert Britton, Chadron M. Friesen “A Convenient Synthesis of Difluoroalkyl Ethers from Thionoesters using Silver(I) Fluoride.” *Chemistry-A European Journal* **2019**, 25 (70),15993–15997 (DOI: 10.1002/chem.201904132).
7. **Céline Bonneaud, Julia Burgess,** Roberta Bongiovanni,Christine Joly-Duhamel, and Chadron M. Friesen "Photopolymerization of Maleimide Perfluoropolyalkylethers without a Photoinitiator.” *Journal of Polymer Science, Part A: Polymer Chemistry* **2019**, 57(6), 699-707**(**DOI: 10.1002/pola.2931).
8. **Giuseppe Trusiano, Melania Rizzello, Julia Burgess**, Chadron M. Friesen, Christine Joly-Duhamel, Roberta Bongiovanni, Alessandra Vitale “Modification of photocurable epoxides by new perfluoropolyalkylether alcohols for obtaining self-cleaning coatings.” *Progress in Organic Coatings* **2019**, *132*, 257-263 (DOI: 10.1016/j.porgcoat.2019.02.043).
9. **Josiah J**. **Newton,** Robert Britton, and Chadron M. Friesen “Base-Catalyzed Transesterification of Thionoesters.” *The Journal of Organic Chemistry* **2018** *83* (20), 12784–12792 (DOI:10.1021/acs.joc.8b02260).
10. **Céline Bonneaud, Mélanie Decostanzi, Julia Burgess, Giuseppe Trusiano, Trevor Burgess**, Roberta Bongiovanni,Christine Joly-Duhamel, and Chadron M. Friesen. “Synthesis of α,β-unsaturated esters of perfluoropolyalkylethers (PFPAEs) based on hexafluoropropylene oxide units for photopolymerization.” RSC Advances, **2018**, ***8*,** 32664 – 32671 (DOI: 10.1039/c8ra06354k).
11. **Trevor J. Burgess; Addison D. G Pasiuk,** Benson J. Jelier, and Chadron M. Friesen “Synthetic access to an elusive high-temperature perfluoroisopropenyl ether prepolymer for radical copolymerization.” Chemical Communications, **2018, *54*,** 10439 - 10442. (DOI: 10.1039/c8cc05241g).
12. [Michael Meanwell](http://pubs.rsc.org/en/results?searchtext=Author%3AMichael%20Meanwell),  [Bharani Shashank Adluri](http://pubs.rsc.org/en/results?searchtext=Author%3ABharani%20Shashank%20Adluri),  [Zheliang Yuan](http://pubs.rsc.org/en/results?searchtext=Author%3AZheliang%20Yuan), [**Josiah Newton**](http://pubs.rsc.org/en/results?searchtext=Author%3AJosiah%20Newton), [Philippe Prevost](http://pubs.rsc.org/en/results?searchtext=Author%3APhilippe%20Prevost),[Matthew B. Nodwell](http://pubs.rsc.org/en/results?searchtext=Author%3AMatthew%20B.%20Nodwell),[Chadron M. Friesen](http://pubs.rsc.org/en/results?searchtext=Author%3AChadron%C2%A0M.%20Friesen), [Paul Schaffer](http://pubs.rsc.org/en/results?searchtext=Author%3APaul%20Schaffer), [Rainer E. Martin](http://pubs.rsc.org/en/results?searchtext=Author%3ARainer%20E.%20Martin), [Robert Britton](http://pubs.rsc.org/en/results?searchtext=Author%3ARobert%20Britton). “Direct heterobenzylic fluorination, difluorination and trifluoromethylthiolation with dibenzenesulfonamide derivatives.” *Chemical Science* **2018**, *9* (25)*,* 5608-5613 (DOI: 10.1039/C8SC01221K).
13. Chadron M. Friesen and Bruno Améduri “Outstanding Telechelic Perfluoropolyalkylethers and Applications Therefrom.” *Progress in Polymer Science* **2018**, *81,* 238-280. [(DOI:10.1016/j.progpolymsci.2018.01.005](https://doi.org/10.1016/j.progpolymsci.2018.01.005)).
14. Chadron M. Friesen and Bruno Améduri “Radical Copolymerization of Vinylidene fluoride (VDF) with Oligo(Hexafluoropropylene oxide) perfluorovinyl Ether Macromonomer to Obtain PVDF-*g*-oligo(HFPO) Graft Copolymers.” *Macromolecules* **2015**, 48 (19), 7060–7070**. (**DOI: 10.1021/acs.macromol.5b01199).
15. **Benson** **J. Jelier**, Jon L. Howell, Daniel B. Leznoff, Craig D. Montgomery, Chadron M. Friesen “A Convenient Route to Tetraalkylammonium Perfluoroalkoxides from Hydrofluoroethers.” *Angewandte Chemie, International Edition* **2015**, *54(10)*, 2945-2949 (DOI: 10.1002/anie.201410639).
16. **Jiří Lapčík,** Olinda Gimello, Vincent Ladmiral, Chadron M. Friesen, and Bruno Ameduri “A new oligo(hexafluoropropylene oxide)-b-oligo(ethylene oxide) diblock surfactant obtained by radical reactions.” *Polymer Chemistry***2015**, *6*, 79-96 (DOI: 10.1039/C4PY00965G).
17. Gregory A. Mountain, **Benson J**. **Jelier,** Christina Bagia, Chadron M. Friesen, and Jelena M. Janjic “Design and formulation of nanoemulsions using 2-(poly(hexafluoropropylene oxide))perfluoropropyl benzene in combination with linear perfluoro(polyethylene glycol dimethyl ether).” *Journal of Fluorine Chemistry,* **2014***, 162*, 38–44(DOI: 10.1016/j.jfluchem.2014.03.007).
18. Chadron M. Friesen, Craig D. Montgomery, **Sebastian A. J. U.** **Temple** “The First Fluorous Biphase Hydrogenation Catalyst Utilizing A Perfluoropolyalkylether: [RhCl(PPh2(C6H4 C(O)OCH2CF(CF3)(OCF2CF(CF3))nF))3] with n= 4-9.” *Journal of Fluorine Chemistry* **2012,** *144***,** 24-32 (DOI: 10.1016/j.jfluchem.2012.09.001).
19. Alexander B.Shtarov, Jon L. Howell, Joseph S. Thrasher, Alfred Waterfeld, Murata Koichi, Chadron M. Friesen, Erik W. Pérez “Synthesis of New Linear Perfluoroalkyl Polyethers Starting from Diols and Tetrafluoroethylene.” *Lubrication Science* **2011**, *23*, 61-80 (DOI: 10.1002/ls.144).
20. Jon L. Howell, Chadron M. Friesen, **Krista L**. **Laugesen,** **Alice E**. **van der Ende,** “Reactions of Poly(hexafluoropropylene oxide) perfluoroisopropyl ketone with Various Amines.” *Journal of Fluorine Chemistry* **2008,** *129(3)***,** 178-184 (DOI: 10.1016/j.jfluchem.2007.10.006).
21. Chadron M. Friesen, Jon L. Howell, **Ashley Jamieson, Daryl A**. **Nyvall** “Understanding the Influence of Hydrocarbon Insulators in Fluorinated Amines: Reactivity of Poly(hexafluoropropylene oxide) Amine Containing Methylene Spacers.” *Journal of Fluorine Chemistry* **2008,** *129(3)***,** 193-203 (DOI: 10.1016/j.jfluchem.2007.10.009).
22. Jon L. Howell, Chadron M. Friesen, Alexander B. Shtarov, Joseph S. Thrasher, Alfred Waterfeld, Erik W. Pérez, Jonathan F. Sullivan “Improved Thermal Stability of Perfluoropolyalkylethers (PFPAEs).” *Journal of Synthetic Lubrication* **2007**, 24(4), 227-234 (DOI: 10.1002/jsl.42).
23. Jon L. Howell, Norman Lu, Chadron M. Friesen“New Derivatives of poly-Hexafluoropropylene Oxide from the Corresponding Alcohol.” *Journal of Fluorine Chemistry* **2005,** *126(3),* 281-288 (DOI: 10.1016/j.jfluchem.2004.09.020).
24. Jon L. Howell, Norman Lu, Chadron M. Friesen, Erik W. Perez, Irek Novak, Alfred Waterfeld, Joseph S. Thrasher “The Preparation of Primary Poly-Hexafluoropropylene Oxide Halides (Poly-HFPO-CF2X where X = I, Br, Cl and F).” *Journal of Fluorine Chemistry* **2004,** *125(10),*1513-1518(DOI: 10.1016/j.jfluchem.2004.06.002).
25. Jon. L. Howell, A. B Shtarov, Jospeh S. Thrasher, Alfred Waterfeld,; Erik W. Pérez, Chadron M. Friesen, Jonathan F. Sullivan, “Degradation of Hexafluoropropylene Oxide (HFPO) Polymers Containing Various End Groups in the Presence of Aluminum Fluoride.” in Fluoropolymer 2000:  Current Frontiers and Future Trends; Smith, Jr., D. W., Ed.; EPS, a division of eMedix, Inc.:  Hattiesburg, MS, 2001; pp 130-135.
26. Jon L. Howell, Michael. A. Hofmann, Alfred Waterfeld, Alexey M. Sipyagin, Chadron M. Friesen, Joseph S. Thrasher "Reactions of Perfluoropolyether (PFPE) Acids and Their Corresponding Salts." *Polymer Preprints, American Chemistry Society, Division of Polymer Chemistry* **1998**, 39(2), 822.
27. Jon L. Howell, Michael. A. Hofmann, Alfred Waterfeld, Alexey M. Sipyagin, Chadron M. Friesen, Joseph S. Thrasher “Reactions of Poly-Hexafluoropropylene Oxide Acids and Their Corresponding Salts.” *Journal of Fluorine Chemistry* **1998**, *89(1)*, 131-135 (DOI: 10.1016/S0022-1139(98)00099-2).

**Technical Reports:**

1. Friesen, Chadron M.; Van Dyke, J. D. (Jack). “PART II-B: Study of the Chlorination of Nylon (PA12), Butyl Rubber(CIIR) & Nylon/Butyl Rubber Blends with and without Isocyanuric Acid (ICA) in Aqueous Sodium Hypochlorite.” *Defence R&D Canada – Technical Report* DRDC-SUFFIELD-TR-2011, **2011.**
2. Friesen, Chadron M.; Van Dyke, J. D. (Jack). “Part II-A: Study of the Chlorination of Nylon & Nylon/Butyl Rubber (CIIR) Blends with and without Isocyanuric Acid (ICA) In Hexanes.” *Defence R&D Canada – Technical Report* DRDC-SUFFIELD-TR-2011, **2011.**
3. Friesen, C. M.; Howell, J. L.; Thawley. V. A. *DuPont Technical Report* DSCE-JL-2007-3, **2007.**
4. Friesen, C. M.; Howell, J. L.; **Nyvall, Daryl A**. *DuPont Technical Report* DSCE-JL-2007-2, **2007.**
5. Friesen, C. M.; Howell, J. L. and **Nyvall, Daryl A**. *DuPont Technical Report* DSCE-JL-2006-24, **2006.**
6. Friesen, C. M.; Howell, J. L. and **Nyvall, Daryl A**. *DuPont Technical Report* DSCE-JL-2006-23, **2006.**
7. Friesen, C. M.; Howell, J. L.; **Jamieson A. L**.; and **Nyvall, Daryl A**. *DuPont Technical Report* DSCE-JL-2006-18, **2006.**
8. Lu, N.; Howell, J. L.; Friesen, C. M. *DuPont Technical Report* DC-JL-2003-8, **2003**
9. Friesen, C.M. “A Chemical Perspective of Wood Composites in A Steam Injection Continuous Press.” *Trus Joist, A Weyerhaeuser Business Technical Report* **2002**.
10. **Friesen, C. M. “Tricaine Methane Sulfonate (TMS): Improvements in manufacturing quality and quantitative control while minimizing solvent disposal.” *Western Chemical Inc. Technical Report*; WCI-2001-1, 2001.**
11. Friesen, C. M. and Howell, J. L. *DuPont Technical Report;* DCSE-JL-2001-8, **2001**.
12. Friesen, C. M. and Howell, J. L. *DuPont Technical Report;* DCSE-JL-2001-13, **2001**.
13. Friesen, C. M. and Howell, J. L. “Low Molecular Weight Krytox® Oil Fluorination.” *DuPont Technical Report* DCSE-JL-99-09, **1999**.

**Patents:**

1. Chadron Mark Friesen; **Benson Jacob Jelier**, Jon L. Howell “Quarternary ammonium perfluoroalkoxy salts for preparation of perfluoropolyethers.” US Patent 9,725,456 B2, August 8, **2017.**
2. Chadron Mark Friesen; **Benson Jacob Jelier**, Jon L. Howell “Quarternary ammonium perfluoroalkoxy salts for preparation of perfluoropolyethers.” PCT Int. Appl.  WO2014110329 A1, July 17, **2014**.
3. J. L. Howell, E. W. Pérez, A. Waterfeld, C. M. Friesen, J. S. Thrasher, “Thermally stable perfluoropolyethers and processes thereof and therewith,”U.S. Patent 7,232,932, June 19, **2007.**
4. Chadron Mark Friesen; **Kevin Anthony Hay, Daryl Nyvall**, Jon L. Howell “Insulated perfluoropolyalkylether (PFPAE) alcohols.” U.S. Pat. Appl. 2006/0287559 Al, December 21, **2006**.
5. Howell, Jon L.; Pérez, Erik W.; Waterfeld, Alfred; Friesen, Chadron Mark; Thrasher, Joseph Stuart; Nowak, Ireneusz. “Perfluoropolyether primary bromides and iodides.” U.S. Pat. 7148385 B2, December 12, **2006**.
6. J. L. Howell, E. W. Pérez, A. Waterfeld, C. M. Friesen, J. S. Thrasher “Perfluoropolyethers and processes therefor and therewith.” EP1632516, March 8, **2006**.
7. Chadron M. Friesen Jon L. Howell, Erik W. Pérez, Joseph S. Thrasher, Alfred Waterfeld. “Thermally Stable Perfluoropolyethers And Processes Therefore and Therewith.” U.S. Pat. 6,753,301 B2, June 22, **2004**.
	1. Howell, Jon L.; Pérez, Erik William; Waterfeld, Alfred; Friesen, Chadron Mark; Thrasher, Joseph Stuart. “Perfluoro-C> 3-alkyl-terminated perfluoropolyoxyalkylenes and perfluoroolefin-perfluoropolyoxyalkylenes as thermal stabilizers for lubricants.” U.S. Pat. Appl. Publ. (2003), 12 pp.
8. Howell, Jon L.; Pérez, Erik W.; Waterfeld, Alfred; Friesen, Chadron Mark; Thrasher, Joseph Stuart; Nowak, Ireneusz. “Perfluoropolyether primary bromides and iodides.” U.S. Pat. 6,653,511 B2, Nov 25, **2003**.
	1. Howell, Jon L.; Pérez, Erik William; Waterfeld, Alfred; Friesen, Chadron Mark; Thrasher, Joseph Stuart; Nowark, Ireneusz. Perfluoropolyether primary bromides and iodides prepared from reactions of perfluoroether acid fluorides with metal iodide and bromides.” U.S. Pat. Appl. Publ. (2003), 5 pp.
9. Chadron M. Friesen Jon L. Howell, Erik W. Pérez, Joseph S. Thrasher, Alfred Waterfeld. “Thermally Stable Perfluoropolyethers And Processes Therefore and Therewith.” *World Intellectual Property Organization*, WO 0206375/ A2, **2002.**

**Conference and Invited Presentations:**

1. **Céline Bonneaud**, Roberta Bongiovanni, Chadron Friesen, Christine Joly-Duhamel\*, "Maleimide monomers: an alternative to the UV formulation based on a radical photoinitiator", 48th International colloquium of GFP, Mulhouse, France, November 25-29, 2019.
2. Brooke,Allan\*; **Newton, Josiah;** **Pulfer, Jason;** Britton, Robert A.; Friesen, Chadron M. “A practical synthesis of fluorinated catechol using silver(I) fluoride.”28th Annual Murdock College Science Research Conference, Vancouver, Washington, November 7-9, 2019 (Awarded 1st Place Prize).
3. Chadron M. Friesen\* “Advancements and applications of telechelic perfluoropolyalky-ethers.”Southern Illinois University, Carbondale, Illinois, USA, November 1, 2019.
4. Chadron M. Friesen\* “The multi-facets of perfluoromethylene oxy (-CF2O-) architecture, 2nd Edition.”Solvay Corporation, Bollate, Italy and Politecnico di Milano, Italy, October 2, 2019.
5. Chadron M. Friesen\* “The multi-facets of perfluoromethylene oxy (-CF2O-) architecture, 1st Edition.”Clemson University, Clemson, South Carolina, USA, September 19, 2019
6. Céline Bonneaud, Medhi Belqat, Arnaud Spangenberd, Roberta Bongiovanni, Chadron M. Friesen, Christine Joly-Duhamel\*“Maleimide monomers: an alternative to the UV formulation based on a radical photoinitiator.”Photopolymerization Fundamentals 2019, Monterey, California, USA, September 15-18, 2019.
7. Chadron M. Friesen\*,**Josiah Newton, Daniel Driedger**, Robert Britton,Rainer Martin “Difluoroalkyl Ethers from Thionoesters using Silver(I) Fluorides.” 19th European Symposium on Fluorine Chemistry, Warsaw, Poland, August 25-30, 2019. (Invited Lecturer)
8. **Josiah J. Newton\*, Daniel Driedger**, Matthew Nodwell, Rainer E. Martin,Paul Schafer, Robert A. Britton, Chadron M. Friesen. “**Nucleophilic Fluorination of Thionoesters with Silver(I) Fluoride.”** 102nd  Canadian Chemistry Conference and Exhibition Québec City, Québec, Canada, June 3-7, 2019.
9. **Daniel Driedger\*, Josiah J. Newton,** Rainer E. Martin, Robert A. Britton, Chadron M. Friesen. “Oxidative Desulfuration-fluorination of Thionoesters using Silver (I) Fluoride: optimization and demonstration of functional group tolerance.”24th Winter Fluorine Conference, Clearwater, Florida, USA, January 13-18, 2019.
10. **Josiah J. Newton\*, Daniel Driedger,** Rainer E. Martin, Robert A. Britton, Chadron M. Friesen. “Recent advances in nucleophilic fluorination of thiocarbonyl compounds with silver(I) fluoride.”24th Winter Fluorine Conference, Clearwater, Florida, USA, January 13-18, 2019.
11. Chadron M. Friesen**\*, Josiah Newton, Daniel Driedger, Céline Bonneaud, Addison Pasiuk, Trevor Burgess, Julia Burgess, Giuseppe Trusiano, Melania Rizzello,** Alessandra Vitale,Roberta Bongiovanni, Christine Joly-Duhamel. “Leveraging perfluoromethylene oxys simply**.”**24th Winter Fluorine Conference, Clearwater, Florida, USA, January 13-18, 2019 (Invited Lecturer).
12. Driedger, Daniel, **Newton, Josiah. J**. Friesen, Chadron M. “Oxidative Desulfuration-fluorination of Thionoesters using Silver (I) Fluoride.”27th Annual Murdock College Science Research Conference, Vancouver, Washington, November 8-10, 2018.
13. **Newton, J. J.\***, Driedger, D., Martin, R. E., Friesen, C. M., and Britton, R. “Recent Advances in Nucleophilic Fluorination of Thiocarbonyl Compounds with Silver(I) Fluoride.” Graduate Student Poster Competition (Institutional), Simon Fraser University, Burnaby, Canada Fall 2018.
14. Chadron M. Friesen\*, **Addison Pasiuk, Josiah Newton, Benson Jelier**. “Hydrofluoroethers and fluorinated alkoxides: how the two are related and leveraged in synthetic strategies.” 22nd International Symposium on Fluorine Chemistry Oxford (United Kingdom) July 22-27, 2018 (Invited Lecturer).
15. **Josiah Newton\*,** Robert Britton**,** Chadron M. Friesen, **“**Base-Catalyzed Transesterification and Oxidative Fluorodesulfuration of Aryl and Heteroaryl Thionoesters.**”** 22nd International Symposium on Fluorine Chemistry Oxford (United Kingdom) July 22-27, 2018 (Poster)
16. Chadron M. Friesen, **Addison Pasiuk\*, Josiah Newton, Benson Jelier**, Daniel Leznoff. “Preparation of fluorinated alkoxides bearing α-fluorines and other fluorinated alkoxides from hydrofluoroethers.” 22nd International Symposium on Fluorine Chemistry Oxford (United Kingdom) July 22-27, 2018 (Poster, Awarded 2nd Place Prize)
17. Chadron M. Friesen\*,**Céline Bonneaud, Addison Pasiuk, Trevor Burgess, Julia Burgess***,* Roberta Bongiovanni, Christine Joly-Duhamel*.* “Advancements and applications of telechelic poly(hexafluoro-propylene oxide).” Fluoropolymer 2018, Denver, Colorado (USA) June 24-27, 2018 (Invited Lecturer).
18. Roberta Bongiovanni\*, Giuseppe Trusiano, Alessandra Vitale, Christine Joly-Duhamel, Chadron M. Friesen. “Perfluoropolyether building blocks for photopolymerisation processes.” Fluoropolymer 2018, Denver, Colorado (USA) June 24-27, 2018
19. **Céline Bonneaud\*, Julia Burgess, Trevor Burgess, Addison Pasiuk, Giuseppe Trusiano,** Alessandra Vitale, Chadron M. Friesen, **Christine Joly-Duhamel**\*, Roberta Bongiovanni **.** “Synthesis and radical photopolymerization of novel maleimide, maleate and vinyl ether perfluoropolylalkylethers.” 17th Polymer and Organic Chemistry Conference, Palava-Les-Flots, France, 3-7 June 2018 (Poster)
20. **Addison Pasiuk\*, Céline Bonneaud, Giuseppe Trusiano**, Alessandra Vitale, Benson J. Jelier, Roberta Bongiovanni, Christine Joly-Duhamel, Chadron M. Friesen.“Synthesis, characterization and optimization of telechelic oligo(hexafluoropropylene oxide) macromonomers from diacycl fluorides and novel initiators.”17th Polymer and Organic Chemistry Conference, Palava-Les-Flots, France, 3-7 June 2018 (Poster)
21. Chadron M. Friesen\* “Progress in telechelic and functional perfluoropolyalkylethers (PFPAEs).” 4 May, 2018, ENSCM, Montpellier (France) (Invited Lecturer)
22. **Céline Bonneaud, Julia Burgess, Trevor Burgess, Addison Pasiuk, Giuseppe Trusiano,** Alessandra Vitale, Chadron M. Friesen, **Christine Joly-Duhamel**\*, Roberta Bongiovanni. *“*Synthèses de perfluoroalkyléthers maléimides et étude de leur photopolymérisation.” ["Groupe Français des Polymères" Conference 2017](http://www.h2020-msca-photofluo.eu/events/dissemination5) , 21-24 November, Paris (France)
23. **Josiah Newton, Benson Jelier**, Chadron M. Friesen. “Strategic Synthesis of Difunctional Hydrofluoroethers.” 8th Banff Symposium on Organic Chemistry (BSOC) Banff, Alberta, Canada October 27-30, 2017.
24. **Céline Bonneaud\***, **Julia Burgess, Trevor Burgess, Addison Pasiuk, Giuseppe Trusiano**, Alessandra Vitale, Chadron M. Friesen, Christine Joly-Duhamel, Roberta Bongiovanni. *“*Radical photopolymerization of novel perfluoropolyalkylethers (PFPAEs).”[Photopolymerization Fundamentals 2017](http://www.h2020-msca-photofluo.eu/events/dissemination) , 17-20 September, Boulder CO (USA).
25. **Roberta Bongiovanni\*,** Alessandra Vitale, Céline Bonneaud, Julia Burgess, Chadron M. Friesen, Christine Joly-Duhamel. “Novel perfluoropolyethers for photopolymerisation processes.”  [Photopolymerization Fundamentals 2017](http://www.h2020-msca-photofluo.eu/events/dissemination) , 17-20 September, Boulder CO (USA).
26. **Céline Bonneaud, Julia Burgess**, Chadron M. Friesen, Christine Joly-Duhamel, Roberta Bongiovanni, **Alessandra Vitale\*.** “Novel perfluoropolyethers for photopolymerization processes.”  [European Polymer Federation Conference 2017](http://www.h2020-msca-photofluo.eu/events/dissemination2) , 2-7 July, Lyon (France).
27. **Céline Bonneaud\***, **Julia Burgess**, Alessandra Vitale, Christine Joly-Duhamel, Chadron M. Friesen, Roberta Bongiovanni. “Photopolymérisation de nouveaux perfluoropolyakyléthers.”
[PolyRay Conference 2017](http://www.h2020-msca-photofluo.eu/events/dissemination3) , 20-21 March, Mulhouse (France).
28. **Trevor J. Burgess**\*, **Benson J. Jelier, Addison D. G. Pasiuk,** Chadron M. Friesen. “[Synthesis of a Unique Fluoropolymer Material for Light-Cured 3D Printing and Aerospace Surface Protectants](http://digitalcommons.library.tru.ca/urc/2017/postersb/29).” Thompson Rivers University Annual Undergraduate Research & Innovations Conference, Kamloops, British Columbia, March 31-April 1, 2017
29. **Julia M. Burgess\***, Christine Joly-Duhamel**, Céline Bonneaud**, Chadron M. Friesen. “Development of New Light-Cured Fluoropolymers for High Performance Coatings and Aerospace Elastomers.” Thompson Rivers University Annual Undergraduate Research & Innovations Conference, Kamloops, British Columbia, March 31-April 1, 2017
30. **Trevor. J. Burgess, Addison D. G. Pasiuk, Benson J. Jelier**and Chadron M. Friesen 1 \* “ Challenges in the successful synthesis of oligo(hexafluoropropylene oxide) perfluoroisopropenyl ether (PIPE)” 23rd Winter Fluorine Conference, Clearwater Beach, Florida, USA January 15-20, 2017.(Invited Lecturer)
31. C. M. Friesen\*, **B. J. Jelier, T. J. Burgess, S. J. Boshart, J. M. Burges,** and **J. J. Newton**. “New avenues to form useful mono- and di- functional perfluoropolyalkylethers using anionic ring-opening polymerization methods for fluorinated epoxides or oxetanes.” First South African Fluorine Symposium (SAFS2016), Cape Town, South Africa, February 14-18, 2016.
32. **Mitchell Pfortmueller\***, Bruno Ameduri, Vincent Ladmiral, **Fraser Parlane**, Chadron M. Friesen “A Path Towards Curing Inoperable Brain Cancers Through MRI Imaging of Fluorine-Tagged Micelles.” 25th Annual Murdock College Science Research Conference, Spokane, Washington, November 4-5, 2016.
33. **Trevor Burgess**\*, Benson J. Jelier and Chadron M. Friesen “Investigation of Synthetic Methods for the Preparation of Krytox® Perfluoroisopropylene Ether (KPIPE).” 24th Annual Murdock College Science Research Conference, Vancouver, Washington, November 6-7, 2015. (First Place in Organic Division)
34. **Julia Burgess\*, Steven Boshart, Benson J. Jelier** and Chadron M. Friesen. “Synthesis of poly(Hexafluoropropylene Oxide) Vinyl Ether from poly(Hexafluoropropylene Oxide) Methylene Alcohol.” 24th Annual Murdock College Science Research Conference, Vancouver, Washington, November 6-7, 2015.
35. **Josiah J. Newton**\*, Mitchell S. Pfortmueller and Chadron M. Friesen “Synthesis of Difunctional Hydrofluoro Ethers.” 24th Annual Murdock College Science Research Conference, Vancouver, Washington, November 6-7, 2015.
36. **Benson J. Jelier**\*, Jon L. Howell,Daniel B. Leznoff, Craig D. Montgomery, Chadron M. Friesen, “Towards a More Efficient Anionic Ring-Opening Polymerization of Hexafluoropropylene Oxide.” 21st International Symposium on Fluorine Chemistry & 6th International Symposium on Fluorous Technologies, Como, Italy, August 23-28, 2015.
37. **Jiří Lapčík**, Olinda Gimello, Vincent Ladmiral, Chadron Mark Friesen\*, and Bruno Ameduri “A new oligo(hexafluoropropylene oxide)-*b*-oligo(ethylene oxide) diblock surfactant obtained by radical reactions.” 22nd Winter Fluorine Conference, St. Petersburg, Florida, USA, January 11-16, 2015. (Invited Lecturer)
38. Chadron M. Friesen\* and **Benson J. Jelier** “New Methods in Anionic Ring-Opening Polymerization of Fluoro-Epoxidesand their Application*.”* Fluoropolymer 2014, San Diego, USA, October 13-15, 2014. (Invited Lecturer)
39. **Jiří Lapčík**, Olinda Gimello, Vincent Ladmiral, Chadron Mark Friesen\*, and Bruno Ameduri “A new oligo(hexafluoropropylene oxide)-*b*-oligo(ethylene oxide) diblock surfactant obtained by radical reactions.” Fluoropolymer 2014, San Diego, USA, October 13-15, 2014.
40. Chadron M. Friesen, Craig D. Montgomery, Daniel B. Leznoff, **Benson J. Jelier**, Jon L. Howell“Nonmetal based perfluoroalkoxides: synthesis, properties, and applications.” 248th American Chemical Society National Meeting & Exposition, San Francisco, California, USA, August 11-14, 2014. (Invited Lecturer)
41. **Benson J. Jelier**, Jon L. Howell, and Chadron M. Friesen\* “Moving from metal to nonmetal-based perfluoroalkoxides: *Does it make a difference*?” Polish Chemical Society, Adam Mickiewicz University, Poznań, Poland, May 13, 2014 and Fluor als Schlüsselelement, Humboldt Universität zu Berlin and Freie Universität Berlin, Germany, May 16, 2014. (Invited Lecturer )
42. **Benson J. Jelier,** Jon L. Howell, and Chadron M. Friesen\* “Nonmetal based perfluoroalkoxides: synthesis, properties, and applications.” Dipartimento di scienza dei materiali ingegneria chimica, Politecnico di Torino, Torin, Italy, April 15, 2014 and Dipartimento di Chimica, Materiali ed Ingegneria Chimica "G. Natta", Politecnico di Milano, Milan, Italy, April 16, 2014 (Invited Lecturer).
43. Chadron M. Friesen\* “Recycling of metals after catalytic reactions using fluorinated ethers.” **Chaire Total de la Fondation Balard** lecture series, Montpellier, France, April 24, 2014 (Invited Lecturer)
44. **Benson J. Jelier,** Jon L. Howell, and Chadron M. Friesen\*. “New methods in anionic ring-opening polymerization of fluoro-epoxides.” **Chaire Total de la Fondation Balard** lecture series, Montpellier, France, April 10, 2014 (Invited Lecturer)
45. **Benson J. Jelier** and Chadron M. Friesen\*. “A Look at perfluoropolyalkylethers for Chronic Pain Theranostics.” **Chaire Total de la Fondation Balard** lecture series, Montpellier, France, February 28, 2014 (Invited Lecturer)
46. **Benson J. Jelier**, Jon L. Howell, and Chadron M. Friesen\*. “Preparation and Utility of

Tetra-alkylammonium Perfluoroalkoxides.” Journee des Polymeristes Languedociens, Montpellier, France, October 3-4, 2013. (Keynote)

1. **Benson J. Jelier**, Jon L. Howell, and Chadron M. Friesen\*. “Innovative Methodology for the Preparation of Quaternary Ammonium Perfluoroalkoxides.” 17th European Symposium on Fluorine Chemistry, Paris, France, July 21- 25, 2013. (Invited Lecturer)
2. **Benson J. Jelier**\*, Craig Montgomery, Jon L. Howell, Daniel B. Leznoff and Chadron M. Friesen. “A General Route to Perfluoroalkoxides from Hydrofluoroethers.” 96th Canadian Chemistry Conference and Exhibition, Quebec City, Quebec, Canada, May 26-30, 2013.
3. Chadron M. Friesen\*, **Benson J. Jelier**, Jon L. Howell, and J. Christopher Greever. “Realizing the reactivity of methoxy-based hydrofluoroethers (HFEs).” 21st Winter Fluorine Conference, St. Petersburg, Florida, USA January 13-18, 2013.(Invited Lecturer)
4. **Benson J. Jelier**\*, Craig Montgomery, and Chadron M. Friesen. “Utilization of Novel Initiators for the Polymerization of Hexafluoropropylene Oxide.” 21st Winter Fluorine Conference, St. Petersburg, Florida, USA ,January 13-18, 2013. (Poster, Award 1st Place Prize)
5. Christopher N. Voth\*, **Benson J. Jelier**, and Chadron M. Friesen. “Utilizing poly(hexafluoropropylene oxide) in fluorous biphase systems.” Fluoropolymer 2012, Las Vegas, Nevada, USA, October 14-17, 2012*.*
6. **Benson J. Jelier**\*, Christopher N. Voth, Daniel B. Leznoff, Craig D. Montgomery, Chadron M. Friesen. “Utilization of Perﬂuoropolyalkylethers for Fluorous Biphasic Systems.” 95th Canadian Chemistry Conference and Exhibition, Calgary, AB. May 26-30, 2012. BC Inorganic Discussion Week (IDW), Squamish, BC. May 11-13, 2012.
7. Chadron M. Friesen\*, **Sebastian A. J. U. Temple**, Craig D. Montgomery, and Jon L. Howell. “Incorporating Poly(hexafluoropropylene oxide) into Wilkinson’s Catalyst: A Fluorous Biphase Approach.” 94th Canadian Chemistry Conference and Exhibition, Montréal, Quebec, Canada, June 5-9, 2011. 16th European Symposium on Fluorine Chemistry, Ljubljana, Slovenia, July 18-23, 2010.
8. Chadron M. Friesen\*, **Sebastian A. J. U. Temple**, Craig D. Montgomery, and Jon L. Howell. “Fluorinated Ethers: A Question of Their Benefit to Catalytic Systems.” 20th Winter Fluorine Conference, St. Petersburg, Florida, USA, January 9-14, 2011.
9. **Benson J. Jelier\*, Sebastian Temple**, Chadron M. Friesen, Craig D. Montgomery, Daniel B. Leznoff. “Fluorous Biphase Catalysis: Utilization of Functionalized Perfluoropolyalkylethers.” BC Inorganic Discussion Week (IDW), Squamish, BC. May 6-8, 2011.
10. **Andrew Dawn\*** and Chadron M. Friesen. “A Clothing Solution.” Western Canadian Undergraduate Chemistry Conference, Lethbridge, Alberta, May 6-8th, 2010.
11. **Elizabeth Krieter, Sebastian Temple, Rose Rogawski** , and Chadron M. Friesen. “Synthesis of Tris(4-Diphenylphosphinyl Polyhexafluoropropylene Oxide Methylene Benzoate) Rhodium Chloride for Use in the Catalytic Hydrogenation of 2-Cyclohexen-1-one.” 19th Regional Murdock Charitable Trust Undergraduate Research Conference, Linfield College, McMinnville, Oregon, November 12-13, 2010
12. **A. Rose Rogawski\*** and Chadron M. Friesen. “Methodology for Protecting and Deprotecting Triaryl Phosphines.” 18th Regional Murdock Charitable Trust Undergraduate Research Conference, Gonzaga University, Spokane, Washington, October 30-31, 2009.
13. Chadron M. Friesen\*, J. Christopher Greever, Jon L. Howell, and Justin M. Hoerter “The Use of Perfluorobutyl Methyl Ethers as Methylating Agents for Amines.” 19th International Symposium on Fluorine Chemistry, Jackson Hole, Wyoming, USA, August 23-28, 2009. (Invited Lecturer)
14. **Crystal M. Wuthrich**\* and Chadron M. Friesen “Synthesis of (4-chlorobenzyl) Diphenyl Phosphine oxide, a Precursor to Fluorous Triarylphosphine Ligand.” 17th Regional Murdock Charitable Trust Undergraduate Research Conference, University of Puget Sound, Tacoma, Washington, November 7-8, 2008 and Western Canadian Undergraduate Chemistry Conference, Thompson River University, Kamloops, British Columbia, May 7-9th, 2009.
15. Chadron M. Friesen\* and Jon L. Howell “Efforts to Prepare Poly(hexafluoropropylene oxide) perfluorovinyl ether.” 15th European Symposium on Fluorine Chemistry, Prague, Czech Republic, July 15-20, 2007.
16. Chadron M. Friesen\*, **Ashley, Jamieson, Daryl Nyvall**, Jon L. Howell. “Understanding Fluorinated Amines Reactions of Poly(hexafluoropropylene oxide) [polyHFPO] Methylene Amine” 18th Winter Fluorine Conference, St. Petersburg, Florida, USA January 14-19, 2007.
17. Chadron M. Friesen\*, **Ashley, Jamieson, Daryl Nyvall**, Jon L. Howell. “**The development of ethyl and propyl alcohols from Radical reactions with poly(hexafluoropropylene oxide) primary iodides**” 17th Winter Fluorine Conference, St. Petersburg, Florida, USA January 9-14, 2005.
18. Chadron M. Friesen\* “Poly(hexafluoropropylene oxide):  From the Manufacturing Process to Utilization in Fluorous Biphase Systems” Simon Fraser University, Burnaby, British Columbia, Canada. October 12, 2004.
19. Joseph S. Thrasher\*, Alfred Waterfeld, Yangliu Zhou, Erik W. Perez, Ireneusz Novak, Michael A. P. Beukama, Kevin A. Hay, Chadron M. Friesen, Jon L. Howell.  “Syntheses and application of poly-hexafluoropropylene oxide primary and secondary bromides and iodides” Fluoropolymer 2004, Savannah, Georgia, October 7-9, 2004.
20. Jon L. Howell\*, **Krista. L. Laugesen, Alice. E. Van der Ende**, and Chadron. M. Friesen. “Reactions of Perfluorinated Ketones with Amines” 14th European Symposium on Fluorine Chemistry, Poznań, Poland, July 11-16, 2004.
21. Chadron M. Friesen\*, **Michael A. P. Beukama, Kevin A. Hay**, and Jon L. Howell. “The development of ethyl and propyl alcohols from Radical reactions with poly(hexafluoropropylene oxide) primary iodides”14th European Symposium on Fluorine Chemistry, Poznań, Poland, July 11-16, 2004.
22. **Michael A.P. Beukema**\* and Chadron M. Friesen. “Synthesis of poly-hexafluoropropylene oxide (poly-HFPO) propyl alcohol: A precursor to insulated triarylphosphines” 17th Annual Western Canadian Undergraduate Chemistry Conference, Regina, Saskatchewan, Canada May 1-4, 2003.
23. Chadron M. Friesen\*, **Krista L. Laugesen**, Jon L. Howell, Joseph S. Thrasher, Yangliu Zhou, Alfred Waterfeld. “Synthesis of a novel fluorous triarylphospine-containing poly-hexafluoropropylene oxide (poly-HFPO)” 16th Winter Fluorine Conference, St. Petersburg, Florida, USA January 12-17, 2003.
24. Jon L. Howell\*, Alexander B. Shtarov, Joseph S. Thrasher, Alfred Waterfeld, Koichi Murata, Erik W. Pérez, Alexey M. Siyagin, and Chadron M. Friesen. “Synthesis of New Perfluoroalkyl Polyethers Starting from Glycols and Tetrafluoroethylene” 13th European Symposium on Fluorine Chemistry, Bordeaux, France, July 15-20, 2001.
25. Chadron M. Friesen\*, Erik W. Pérez\*, Jon L. Howell, Joseph S. Thrasher, Alfred Waterfeld, Irik Nowak, Andy N. Wood, and Jonathan F. Sullivan. “Fluorous Biphase Chemistry Utilizing Perfluoropolyalkylethers.” 219th American Chemical Society National Meeting & Exposition, San Francisco, California, USA March 26-30, 2000. & 16th International Symposium on Fluorine Chemistry, Durham, UK, July 16-21, 2000.
26. Jon L. Howell\*, Joseph S. Thrasher, Alfred Waterfeld, Koichi Murata, Erik W. Pérez, Chadron M. Friesen “Degradation of Hexafluoropropylene Oxide (HFPO) Polymers Containing Various End Groups in the Presence of Aluminium Fluoride.“ 16th International Symposium on Fluorine Chemistry, Durham, UK, July 16-21, 2000.
27. Joseph S. Thrasher\*; Alfred Waterfeld, Alexey M. Sipyigin, Chadron M. Friesen, Jon L. Howell, and Michael A. Hofmann. “The use of carbon-13 NMR spectroscopy to determine the end groups in perfluoropolyethers (PFPEs).” 216th ACS National Meeting, Boston, USA August 23-27, 1998.

**INVITED FLUORINE RESEARCH INSTRUCTOR:**

## **Adam Mickiewicz University, Faculty of Chemistry, Poznań (Poland)**

## Chadron M. Friesen Short Graduate Course in “Fluorine Chemistry-Pharmaceuticals and Perfluoropolylalkylethers (PFPAEs).” June 17-21, 2019.

**Ecole Nationale Supérieure de Chimie de Montpellier, Montpellier Cedex (France)**

1. Chadron M. Friesen. “Perfluoropolyalkylethers (PFPAEs) Part I: Why should one care?” Lecture for 3A, November 18, 2014.
2. Chadron M. Friesen. “Perfluoropolyalkylethers (PFPAEs) Part II: Applications.” Lecture for 3A, December 4, 2014.
3. Chadron M. Friesen. :Perfluoropolyalkylethers (PFPAEs) Part III: Applications continued & Better Initiators.” Lecture for 3A, December 9, 2014.
4. Chadron M. Friesen. “Industrial History & Application Towards Building Functionalized Perfluoropolyalkylethers (PFPAEs) Part I?” Lecture for 2A, Montpellier, France, February 28, 2014.
5. Chadron M. Friesen. “Perfluoropolyalkylethers (PFPAEs) Part II: Why should one care?” Lecture for 2A, Montpellier, France, March 26, 2014.
6. Chadron M. Friesen. “Perfluoropolyalkylethers (PFPAEs) Part III: Better Initiators.” Lecture for 2A, Montpellier, France, April 8, 2014.

**Fluor als Schlüsselelement, Freie Universität, Berlin (Germany)**

1. Chadron M. Friesen “Designing perfluoropolyalkylethers (PFPAEs) for tribological applications: filling voids in the industrial market.”, Berlin, Germany, May 15, 2014.

**Politecnico di Torino, Torino (Italy)**

1. Chadron M. Friesen **“Buongiorno Fluorine (Fluoro).”** Turin, Italy May 28,2018.

**Courses Taught:**

General Chemistry I (CHEM 103)
General Chemistry II (CHEM 104)
Organic Chemistry I (CHEM 221)
Organic Chemistry II (CHEM 222)
Thermodynamics (CHEM 240)
Advance Organic I (CHEM 321)
Advance Organic II (CHEM 322)
Analytical Chemistry I (CHEM 357)
Analytical Chemistry II (CHEM 358)
Fluorine Chemistry (CHEM 400)
Senior Research Thesis (Chem 409/410)

**Current and Past Funding (Total Funding =$1.4 Million CND):**

Name/Title of Project**:** Non­Metal Based Perfluoroalkoxides for New Fluoropolymeric  Materials, Theranostics, Pharmaceuticals,and Catalysts

Value($): 100,000 CND

Duration: 5 years

Dates: 2015-2020

Funding Agency: *National Science and Engineering Research Council (NSERC)*

Name/Title of Project: **M. J. Murdock Charitable Trust Research Program Ramp-up grant**

 Value($): **$16,776** (funding was distributed among 13 faculty, the amount reported was my portion

Duration: 2 years

Dates: 2017-2019

Funding Agency: **M. J. Murdock Charitable Trust**

Name/Title of Project**:** Synthesis and photopolymerisation of new fluorinated macromonomers for the obtaining of high performance fluoropolymers

Value(€): 153, 000 (Joint with Dr. Roberta Bongiovanni (Italy) and Dr. Christine Joly-Duhamel, France)

Duration: 4 years

Dates: 2016-2019

Funding Agency: Horizon 2020-*Marie Skłodowska-Curie Actions: Research and Innovation Staff Exchange (RISE), European Commission*

Name/Title of Project: Novel 19F-MRI Theranostic Agents: For Enhanced cellular uptake and *in vivo* tracking of drug delivery

 Value($) 5,000 USD

Duration: Summer

Dates: 2015

Funding Agency: *Moissan SURF Award; American Chemical Society, Fluorine Division*

Name/Title of Project**:** Chair Total Fondation Balard

Value(€): 7,000 euro

Duration: 3 months

Dates: 2014

Funding Agency: *Pôle chimie Balard*

Name/Title of Project**:** Formation and Utilization of Stable alpha-Fluorine Based Perfluoroalkoxide

Value($): $4,000 CND

Duration: 1 yr

Dates: 2014

Funding Agency: *Trinity Western University’s Internal Research Grant*.

Name/Title of Project**:** Advanced Analytical Laboratory

Value($): $449,340 CND

Duration: 1 yr

Dates: 2012-2013

Funding Agency: *Canada Foundation for Innovation Leadership Opportunity Fund*

Name/Title of Project**:** Advanced Analytical Laboratory

Value($): *$449,320* CND

Duration: 1yr

Dates: 2012-2013

Funding Agency: *Western Economic Diversification Canada, Western Diversification Program*

Name/Title of Project**:** Advanced Analytical Laboratory

Value($): *$95,000* CND

Duration: 1yr

Dates: 2012-2013

Funding Agency: *Dunell Estate*

Name/Title of Project: Fluorous Microdroplet Technology

Value($)3,500 USD

Duration: Summer

Dates: 2012

Funding Agency: *Moissan SURF Award; American Chemical Society, Fluorine Division*.

Name/Title of Project**:** Utilizing Poly(hexafluoropropylene oxide) phosphino Ligands in Fluorous Biphase Catalysis (FBC):

Value($)100,000 CND (Joint Project with Craig Montgomery at Trinity Western University)

Duration 5 yrs

Dates: 2006 -2011

Funding Agency: *National Science and Engineering Research Council (NSERC)*

Name/Title of Project: Thermoplastic Elastomers

Value($) $79,500 (Joint Project with Jack VanDyke at Trinity Western University)

Duration: 3 years

Dates: Feb 2009-2011

Funding Agency: *Department of National Defence*

Name/Title of Project: Genetic Manipulation and/or Polymerization of Commercial Monomers

Value($) $16,432

Duration: 1 year

Dates: Feb 2010-2011

Funding Agency: *Material Sequences LLC*

Name/Title of Project: Development of new binders for 3D printing

Value($)$2741.59 (Joint Project with Jack VanDyke at Trinity Western University)

Duration: 4 months

Dates: Feb-May 2009

Funding Agency: *Offload Studios*

Name/Title of Project: Synthesis, process development, and scale up of Functional Poly(hexafluoropropylene oxide)

Value($) 60,000 USD

Duration: 12 months

Dates: August 2006-2007

Funding Agency: *E. I. duPont de Nemours & Company Inc.*

Name/Title of Project: Heck olefination of halotriphenylphosphine oxide with poly(hexafluoropropylene oxide)ethylene

Value($)2,500 USD

Duration Summer

Dates: 2005

Funding Agency: *American Chemical Society Fluorine Division.*

Name/Title of Project: Fluorous biphase chemistry utilizing perfluoropolyalkylethers

Value($)4,000 CND

Duration 1 yr

Dates: 2002 and 2004

Funding Agency: *Trinity Western University’s Internal Research Grant.*

Name/Title of Project: HPLC Method development to determine purity of 3,6-dihyroxy-2,4-bis-[N,N’-di-(carboxymethyl)-aminomethyl] fluoran during manufacturing

Value($)25,160 CND

Duration 4 month

Dates: Mar-June 2003

Funding Agency: *Western Chemical Inc*.

Name/Title of Project: Chemical Perspective of Wood Composites in a Steam Injection Process.

Value($) 4,810 CND

Duration 2 months

Dates: June-July 2002

Funding Agency: *Weyerhaeuser*

Name/Title of Project: Production of 3,6-dihyroxy-2,4-bis-[N,N’-di-(carboxymethyl)-aminomethyl] fluoran.

Value($)5,655 CND

Duration 1 month

Dates: Feb-Sept 2001 March-April 2002

Funding Agency: *Western Chemical Inc*.

Name/Title of Project: Synthesis, process development, and scale up of oxetane and its polymerization

Value($) 16,867 CND

Duration: 3 months

Dates: April-June 2001

Funding Agency: *E. I. duPont de Nemours & Company Inc.*

Name/Title of Project: Tricaine Methane Sulfonate Manufacturing Improvements.

Value($) 10,176 CND

Duration: 1 yr

Dates: Oct 2000-Sept 2001

Funding Agency: *Western Chemical Inc.*

**PROFESSIONAL SOCIETIES:**

* Member of American Chemical Society, Division of Fluorine Chemistry (1996-present)
* Eagle Scout (1987), Boy Scouts of America.

**Training of Highly Qualified Personnel:**

**Supervision of research thesis (PhD, MSc, BSc):**

1. Jeremy Harder “Self-Cleaning Superhydrophobic Surfaces with modifiable antimicrobial functionality.” *B.Sc. Research Thesis*, Trinity Western University **2019**
2. Levi Neufeld “Polydimethylsiloxane based microfluidic reactor for the polymerization of poly(hexafluoropropylene oxide.” *B.Sc. Research Thesis*, Trinity Western University **2018**
3. Josiah Newton“Acidic Dealkoxylation-Fluorination of Orthoesters.” *B.Sc. Research Thesis*, Trinity Western University **2017**
4. Eva Sykora“Copolymerization of poly-(para-(trifluoromethoxy Benzoyl diethylene glycol methacrylate) with para-formylphenyl methacrylate.” *B.Sc. Research Thesis*, Trinity Western University **2017.**
5. Thomas Holmes “Synthesis of Difunctional Perfluorinated Polyalkylethers.” *B.Sc. Research Thesis*, Trinity Western University **2016**
6. Benson J. Jelier (2010-2016)- Doctor of Philosophy (Ph.D.), Chemistry -Preparation and Applications of Perfluoroalkoxides Bearing α-Fluorines. Dissertation Simon Fraser University **2016**. Awarded a National Science and Engineering Research Council (NSERC) Postdoctoral Fellowship (PDF) for 2016 at ETH-Zürich with Prof. Antonio Togni.
7. Steven J. Boshart “Synthesis of poly(Hexafluoropropylene Oxide) Vinyl Ether Using an Air-Stable Palladium (II) Catalyst via the Transetherification of poly(HexafluoropropyleneOxide) Methylene Alcohol and Ethyl Vinyl Ether.” *B.Sc. Research Thesis*, Trinity Western University **2015**.
8. Suha Handal “Fluorous Biphase Catalysis.” *B.Sc. Research Thesis*, Trinity Western University **2013**.
9. Caitlyn Grypma (De Jong) “Understanding micelles development in poly(hexafluoropropylene oxide) based materials.” *B.Sc. Research Thesis*, Trinity Western University **2012** and Moissan summer undergraduate research fellowship in fluorine chemistry **2012**.
10. Andrew Kowan “Synthesis of new fluorous triarylposphines.” *B.Sc. Research Thesis*, Trinity Western University **2012**.
11. Michael Moore “The Synthesis of Novel Double Stranded DNA Binding Molecules Using arginine and Guanidine Residues: A method of Specific Sequence Targeting.” *B.Sc. Research Thesis*, Trinity Western University **2012** and, “Chlorination of Nylon/Butyl Rubber.” Defense Research Project **2011**.
12. Sebastian Temple (2008-2011) “Synthesis of flexible, fluorous 'ponytail' modified triarylphosphines for utilization in fluorous biphase systems.” Master's Thesis, Simon Fraser University **2011**.
13. Kristina Selvig *“Recycling used clothing made of cotton.”B.Sc. Research Thesis*, Trinity Western University **2011**.
14. Kathryn Raymond “Syntheis and Characterization of New Polyfluoroalkylether Triaryl phosphines ligands for fluorous Biphase Catalysis.” *B.Sc. Research Thesis*, Trinity Western University **2011**.
15. Hilda Cao Research Thesis, “A ring-opening polymerization of hexafluoropropylene oxides (HFPO) in Fluorous Biphasic System with the presence of quaternary ammonium salts (Q+RfO-).” *B.Sc. Research Thesis*, Trinity Western University **2010**.
16. Andrew Dawn “Solubility of cellulose in textile blends.” *B.Sc. Research Thesis*, Trinity Western University **2010**
17. A. Rose Rogawski “Methodology for protecting triaryl phosphines.” *B.Sc. Research Thesis*, Trinity Western University **2010**.
18. Benjamin Linkwich “Diphenyl-4-poly(hexafluoropropylene oxide)benzylphosphine.” *B.Sc. Research Thesis*, Trinity Western University **2009**.
19. Matthew Norman “Development of Fluorine Based Catalysts for Hydroformylation.” *B.Sc. Research Thesis*, Trinity Western University **2009**.
20. Jonathan Paxon “Syntheis of (4-(Polyhexafluoropropylene oxide methyl) phenyl
21. ether)diphenylphosphine as a Fluorous Biphase Catalysis Ligand.” *B.Sc. Research Thesis*, Trinity Western University **2008**.
22. Kandice Waul-Bennett “Synthesis of the Electronically Insulated Ligand using Silicon.” *B.Sc. Research Thesis*, Trinity Western University **2006**.
23. Ashely Jameison “The preparation and characterization of polyhexafluoropropylene oxide amine derivatives containing a methylene spacer.” *B.Sc. Research Thesis*, Trinity Western University **2006** and Moissan summer undergraduate research fellowship in fluorine chemistry **2005.**
24. Kiera T. Reifschneider “Ligands for fluorous biphase catalysis: copper-mediated cross-coupling in the systhesis of perfluoroalkylether-triphenylphosphine ligand.” *B.Sc. Research Thesis*, Trinity Western University **2006**.
25. Tina Yoon “The synthesis and examination of the rhodium complex, RhP{C6H5C2CF(CF3)(OCF2CF(CF3))nFH(CO) as a hydroformylation catalyst.” *B.Sc. Research Thesis*, Trinity Western University **2006**.
26. Kevin A. Haye “Perfluoroalkylether Alcohols.” *B.Sc. Research Thesis*, Trinity Western University **2005**.
27. Alice van der Ende “Synthesis of novel fluorous soluble triarylphosphineligands with poly(hexafluoropropylene oxide).” *B.Sc. Research Thesis*, Trinity Western University **2004**.
28. Krista Lynn Laugesen “Reactions of Poly(hexafluoropropylene oxide) perfluoroisopropyl ketone with Various Amines.” *B.Sc. Research Thesis*, Trinity Western University **2003**.
29. Michael Buekema “Fluorous Biphase Catalysis” *B.Sc. Research Thesis*, Trinity Western University **2003**.
30. David Hjerpe “Fluorous Biphase Catalysis.” *B.Sc. Research Thesis*, Trinity Western University **2002**.

**Supervision of Summer Undergraduate/Graduate Research:**

*Graduate students are labeled with MSc or PhD*

1. Bastian Duhamel (BSc) “Introducing functional groups containing fluorine into small molecules for pharmaceuticals and /or monomers for polymerization.” **2020**. (France)
2. Jason Pulfer “Telechelic perfluoropolyalkylethers containing micro-carbon cages.” and “Telechelic Perfluoropolyalkylethers (PFPAEs).” NSERC (**2018**) and TWU USRA (**2019**), respectively.
3. Alan Brooke “Small Molecule Fluorine Chemistry.” TWU USRA **2019.**
4. Samuel Louw “Telechelic perfluoropolyalkylethers containing micro-carbon cages.” NSERC USRA **2019**.
5. Prof. Roberta Bongiovanni “Synthesis of perfluoropolyalkylethers insulated diols.” Horizon 2020-Marie Skłodowska-Curie Actions September **2017.** (Italy)
6. Céline Bonneaud (PhD) “Synthesis and photopolymerization of maleimido and maleate perfluoropolyalkylethers (PFPAEs) based upon oligo(hexafluoropropylene oxide) methylene alcohols.” Horizon 2020-Marie Skłodowska-Curie Actions April-December **2017.** (France)
7. Giuseppe Trusiano (MSc) “Synthesis of perfluoropolyalkylethers insulated diols.” And “photocurable perfluoropolyalkylethers (PFPAEs) based upon oligo(hexafluoropropylene oxide).” Horizon 2020-Marie Skłodowska-Curie Actions April-October **2017,** March-August **2018.** (Italy)
8. Melania Rizzelo (MSc) “photocurable perfluoropolyalkylethers (PFPAEs) based upon oligo(hexafluoropropylene oxide)” Horizon 2020-Marie Skłodowska-Curie Actions March-June **2018.** (Italy)
9. Trevor Burges “poly(hexafluoropropylene oxide) perfluorisopropylene” NSERC & TWU Undergraduate Student Research Award (USRA), and Jack VanDyke Research Fund **2015**-**2018**.
10. Julia Burgess “Polymerization of oligo(hexafluoropropylene oxide) vinyl ether “NSERC & TWU Undergraduate Student Research Award (USRA) **2015**-**2018**.
11. Mitchel Pfortmueller “Novel 19F-MRI Theranostic Agents: For Enhanced cellular uptake and *in vivo* tracking of drug delivery.” Moissan summer undergraduate research fellowship in fluorine chemistry **2015** and MJ Murdoc Charitable Trust **2016.**
12. Josiah Newton “Novel 19F-MRI Theranostic Agents: For Enhanced cellular uptake and *in vivo* tracking of drug delivery.” Moissan summer undergraduate research fellowship in fluorine chemistry **2015.**
13. Dr. Christine Joly-Duhamel “Synthesis and photopolymerisation of new fluorinated macromonomers for the obtaining of high performance fluoropolymers.” **2015** and **2019**. (France)
14. Claire Fargue (MSc) “Synthesis and photopolymerisation of new fluorinated macromonomers for the obtaining of high performance fluoropolymers.” **2015**. (France)
15. Fraser Parlane “Novel Self-assembled Fluorinated Block Copolymers from Zwitterionic monomers for 19F MRI Contrast Agents.” **2014;** (USRA Winter **-2015)**.
16. Christopher Smith “Understanding the mechanism of hydrofluoroethers with secondary amines.” Biotechnology CO-OP Spring **2015.**
17. Jiří Lapčík (MSc)“A new oligo(hexafluoropropylene oxide)-*b*-oligo(ethylene oxide) diblock surfactant obtained by radical reactions.” **2013-2014**.
18. Chris Voth “Utilizing poly(hexafluoropropylene oxide) in Fluorous Biphase Catalysis.” Undergraduate Summer Research Assistantship (USRA) **2011-2012.**
19. Craig MacDermett “Utilizing poly(hexafluoropropylene oxide) in Fluorous Biphase Catalysis.” Undergraduate Summer Research Assistantship (USRA) **2011**.
20. Elizabeth Kreiter “Catalysts for Fluorous Biphase Systems.” Undergraduate Summer Research Assistantship (USRA) **2010**.
21. Crystal Wutherich “Utilizing poly(hexafluoropropylene oxide) in Fluorous Biphase Catalysis.” Undergraduate Summer Research Assistantship (USRA) **2008.**
22. Myra Virginia “Fluorous Biphase Catalysis.” TWU Department of Chemistry Summer Research Support **2006**.
23. Amanda Victoria Pratt “Fluorous Biphase Catalysis.” TWU Department of Chemistry Research Support **2005-2006.**
24. Jordan Charles “Fluorous Biphase Catalysis.” TWU Department of Chemistry Research Support **2005-2006.**
25. Michael Jordan Graff “Fluorous Biphase Catalysis.” TWU Department of Chemistry Research Support **2005-2006.**
26. Daryl A. Nyvall “Fluorous Biphase Catalysis.” TWU Department of Chemistry Summer Research Support **2004-2005**.
27. Esther Jean Warkentin “Fluorous Biphase Catalysis.” TWU Department of Chemistry Research Support **2005.**
28. Leanne Edwards “Industrial Scale-Up of SE-MARK.” TWU Western Chemical Research Project **2003**.
29. Christopher Buschhaus “Synthesis of Metallated Phosphoranes .” TWU Department of Chemistry Research Support **2002**.
30. Samuel Jones “Forming of perfluoroalkylether-aryl.” TWU Department of Chemistry Research Support **2001**
31. Mariam Buschhaus “Chemical Salmon Tagging.” Western Chemical Research Project **2001**.
32. Brad A. BeeBe “Perfluoropolyalkylethers.” TWU Department of Chemistry Research Support **2001.**

**Community Presentations:**

1. Chadron M. Friesen “Industry Practices: a look at the development of intellectual property.
What is right or wrong?” CMPT 480 Ethical and Social Issues in High Technology, Trinity Western University, Nov. 25, 2008.
2. Chadron M. Friesen “SE-MARKTM: a Promising Tool for Hatchery Product Evaluation.” Faculty Retreat, 2003.

**Community Involvement**:

* Scout Leader for 1st Walnut Grove, Scouts Canada (2010-2013,2015,2017-present)
* Commander for the AWANA program in Fort Langley (2007-2013,2014-present)