

# Dr Alison Bain

POSTDOCTORAL RESEARCH ASSOCIATE

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## Education

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### McGill University

DOCTOR OF PHILOSOPHY, CHEMISTRY

Montreal, QC

2021

### University of British Columbia

MASTER OF SCIENCE, CHEMISTRY

Vancouver, BC

2016

### Carleton University

BACHELOR OF SCIENCE, HIGHEST HONOURS CHEMISTRY, CONCENTRATION IN NANOTECHNOLOGY

Ottawa, ON

2013

## Research Experience

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### University of Bristol

POSTDOCTORAL RESEARCH ASSOCIATE

Bristol, UK

2021 – PRESENT

Supervised by Dr Bryan Bzdek, my research investigates the effects of surfactants in ternary aqueous systems, comparing partitioning in macroscopic solutions to picoliter droplets.

### McGill University

PHD THESIS WORK

Montreal, QC

2016 – 2021

Supervised by Prof. Thomas Preston, my thesis work focused on building optical setups and using single particle optical spectroscopy to characterize the complex refractive index aerosol particles as well as building models for the refractive index as a function of composition and wavelength. In addition to my thesis work, I investigated the hygroscopicity of microplastics and the effect of microplastics on the hygroscopicity of aqueous systems relevant to atmospheric aerosol.

### University of British Columbia and Canfor Pulps Ltd.

MITACS ACCELERATE PROJECT

Vancouver, BC

2015 – 2016

Supervised by Prof. Ed Grant and Dr. Paul Bicho, I designed and tested a Raman probe for characterizing wood pulps during inline processing.

### University of British Columbia

MSc THESIS WORK

Vancouver, BC

2013 – 2016

Supervised by Prof. Ed Grant and in collaboration with Canfor Pulps Ltd., I used Raman spectroscopy and chemometrics for the prediction of wood pulp physical properties including viscosity and tensile strength.

### Carleton University

UNDERGRADUATE HONOURS THESIS RESEARCH PROJECT

Ottawa, ON

2012

Supervised by Prof. Sean Barry, I designed and tested methods for metal assisted electrochemical etching of silicon for light harvesting.

## Teaching Experience

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*Demonstrating labs, answering student questions on discussion boards, grading reports and final projects, holding tutorials, supervising teaching assistants, developing course materials.*

### Supervisory Teaching Assistant

CHEM 377 & 493: INSTRUMENTAL ANALYSIS AND ADVANCED PHYSICAL CHEMISTRY LABORATORY

McGill University

2021

### Teaching Assistant

CHEM 110, 120, 345 & 493: GENERAL CHEMISTRY I & II LABORATORIES, QUANTUM CHEMISTRY, ADVANCED PHYSICAL CHEMISTRY LABORATORY

McGill University

2016 – 2019

### Teaching Assistant

CHEM 121, 123 & 315/323/335/345: GENERAL CHEMISTRY I & II LABORATORIES & INTEGRATED CHEMISTRY LABORATORIES

University of British Columbia

2013 – 2016

### Undergraduate Teaching Assistant

CHEM 1101 & 3503: CHEMISTRY FOR ENGINEERS AND INORGANIC CHEMISTRY I

Carleton University

2009 – 2013

## Research Support

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MCGILL SUSTAINABILITY SYSTEMS INITIATIVE IDEAS FUND

2020

Thomas C. Preston and **Alison Bain** "The effect of microplastics on cloud droplet formation"

## Publications

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### Peer Reviewed Publications

8. H. Yin, J. Dou, L. Klein, U. K. Krieger, **A. Bain**, B. J. Wallace, T. C. Preston, and A. Zuend, "Extension of the AIOMFAC model by iodine and carbonate species: applications for aerosol acidity and cloud droplet activation" *Atmospheric Chemistry & Physics*, 2022, 22, 973–1013.
7. **A. Bain** and T. C. Preston, "Hygroscopicity of microplastics and mixed microplastic-ammonium sulfate systems" *Environmental Science & Technology*, 2021, 55(17), 11775 – 11783.
6. **A. Bain** and T. C. Preston, "The wavelength-dependent optical properties of weakly absorbing aqueous aerosol particles" *Chemical Communications*, 2020, 56, 8928 – 8931.
5. C. L. Price, **A. Bain**, B. J. Wallace, T. C. Preston, and J. F. Davies, "Simultaneous retrieval of the size and refractive index of suspended droplets in a linear quadrupole electrodynamic balance" *The Journal of Physical Chemistry A*, 2020, 124(9), 1811 – 1820.
4. **A. Bain**, A. Rafferty, and T. C. Preston, "The wavelength-dependent complex refractive index of hygroscopic aerosol particles and other aqueous media: an effective oscillator model" *Geophysical Research Letters*, 2019, 46, 10636 – 10645.
3. **A. Bain**, and T. C. Preston, "Mie scattering from strongly absorbing airborne particles in a photophoretic trap" *Journal of Applied Physics*, 2019, 125, 093131.
2. **A. Bain**, A. Rafferty, and T. C. Preston, "Determining the size and refractive index of single aerosol particles using angular light scattering and Mie resonances" *Journal of Quantitative Spectroscopy and Radiative Transfer*, 2018, 2221, 61 – 70.
1. N. Tavassoli, Z. Chen, **A. Bain**, L. Melo, D. Chen, and E. R. Grant, "Template-oriented genetic algorithm feature selection of analyte wavelets in the Raman spectrum of a complex mixture" *Analytical Chemistry*, 2014, 86(21), 10591.

### Conference Proceedings

1. A. Christy, N. Tavassoli, **A. Bain**, L. Melo, and E. R. Grant, "Wide-field confocal interferometric backscattering (iSCAT)-Raman microscopy," in *Optics in the Life Sciences, OSA Technical Digest* (online) (Optical Society of America, 2015).

### Manuscripts in Preparation

1. **A. Bain** "Buoyancy and Brownian motion of plastics in aqueous solution: Predictions and implications for density separation and aerosol mixing state"

## Theses

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3. **A. Bain**, The refractive index of single aerosol particles: measurements and models. PhD thesis, 2021. Advisor Prof. Thomas C. Preston. Faculty of Graduate and Postdoctoral Studies, McGill University.
2. **A. Bain**, Property prediction with Raman spectroscopy in the pulp and paper industry: a chemometric approach. MSc thesis, 2016. Advisor Prof. Ed Grant. Faculty of Graduate and Postdoctoral Studies, University of British Columbia.
1. **A. Bain**, Metal assisted chemical etches of silicon, BSc honours thesis, 2012. Advisor Prof. Sean Barry. Faculty of Science, Carleton University.

## Conference Presentations

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### American Geophysical Union Fall Meeting

**A. Bain** and T. C. Preston, "Contributions of ions and organics to the refractive index of weakly absorbing, aqueous aerosol", December 9, 2020 (poster).

### Chemistry and Biochemistry Graduate Research Conference

**A. Bain** and T. C. Preston, "The refractive index of aqueous media: Considering solute concentration, wavelength and temperature", November 20, 2020 (oral).

### Chemistry and Biochemistry Graduate Research Conference

**A. Bain**, A. Rafferty and T. C. Preston, "The wavelength-dependent optical properties of weakly absorbing aqueous aerosol: model and measurements", November 15, 2019 (oral).

### Canadian Chemistry Conference and Exhibition

**A. Bain**, A. Rafferty and T. C. Preston, "An oscillator model for determining the complex refractive index of weakly absorbing aerosol", June 6, 2019 (poster - Award winning presentation).

### Chemistry and Biochemistry Graduate Research Conference

**A. Bain** and T. C. Preston, "Overcoming the barriers to characterizing strongly absorbing aerosol particles", November 9, 2018 (oral).

### SPIE. Optics and Photonics — Optical Trapping and Manipulation XV

**A. Bain** and T. C. Preston, "Investigating light absorbing atmospheric particles using a hollow beam optical trap and broadband scattering", August 20, 2018 (poster).

## Chemistry and Biochemistry Graduate Research Conference

A. Bain and T. C. Preston, "Designing a hollow beam optical trap for the study of atmospheric aerosol particles", November 10, 2017 (oral).

## Awards and Distinctions

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### PhD Thesis in the Top 10% | 2021

Doctoral thesis ranked in the top 10% by the external reviewer.

### Graduate Mobility Award | 2019

Fellowship awarded to cover cost of a research stay at the University of California, Irvine.

### Molson & Hilton Hart Fellowship | 2019

Fellowship awarded to fund graduate research for the 2019-2020 academic year in the Department of Chemistry, McGill University.

### Best Poster in Environment CCCE | 2019

Awarded for the presentation of for "An oscillator model for determining the complex refractive index of weakly absorbing aerosol" at the 102nd Canadian Chemistry Conference and Exhibition.

### David J. Simkin Award in Physical Chemistry | 2019

Awarded for excellence in the first two years of graduate studies in McGill Chemistry.

### Graduate Excellence Fund Travel Grant | 2019

Awarded to cover costs associated with attending the 102nd Canadian Chemistry Conference and Exhibition.

### Graduate Excellence Fund Travel Award | 2018

Awarded to cover costs associated with attending the 21st annual Chemistry and Biochemistry Graduate Research Conference.

### T. Sterry Hunt Award in Chemistry | 2018

Awarded for teaching assistance excellence in the 2017 – 2018 academic year, CHEM493 - Advanced Physical Chemistry Laboratories.

### Graduate Research Enhancement and Travel Award | 2018

Awarded to cover costs associated with attending the SPIE. Optics and Photonics Conference 2018.

### Richard T Mohan Scholarship | 2018

Awarded by the Department of Chemistry at McGill University to a postgraduate student proceeding to the PhD degree.

### Graduate Excellence Fund Travel Award | 2017

Awarded to cover costs associated with attending the 20th annual Chemistry and Biochemistry Graduate Research Conference.

### MITACS Accelerate | 2015

Awarded a MITACS Accelerate to fund research partnered with Canfor Pulps Ltd.

### UBC Entrance Scholarship | 2013

Awarded an entrance scholarship from the Department of Chemistry at the University of British Columbia.

## Skills

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<b>Technical Computing</b>	MATLAB, Mathematica, Python
<b>Optics</b>	Skilled in optical alignment
<b>Instrument Development</b>	Development of single particle trapping and characterization techniques
<b>Teaching</b>	Leading tutorials, demonstrating experiments and supervising teaching assistants
<b>Course Design</b>	Tomlinson course design workshop

## Other Activities

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### Inclusive Research Collective (IRC) steering group | 2022

Steering group member for the development of a pilot training program about inclusive research practice at the University of Bristol.

### Peer mentor | 2020 – 2021

Chemistry Graduate Student Society (CGSS) peer mentor program

### Chemistry Graduate Student Society (CGSS) of McGill University | 2016 – 2020

Treasurer 2017 – 2020, acting President winter 2019, First Year Representative 2016 – 2017

### McGill Chemistry web communications committee | 2018 – 2020

Graduate student representative

### University of British Columbia (UBC) Chemistry safety committee | 2015 – 2016

Graduate student representative