Dr Alison Bain

Postdoctoral Research Associate

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Education

McGill University — *Montreal, QC*

Doctor of Philosophy, Chemistry — *2021*

University of British Columbia — *Vancouver, BC*

Master of Science, Chemistry — *2016*

Carleton University — *Ottawa, ON*

Bachelor of Science, Highest Honours Chemistry, Concentration in Nanotechnology — *2013*

Research Experience

University of Bristol — *Bristol, UK*

Postdoctoral Research Associate — *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 using a combination of bulk and single particle techniques. Ongoing collaborations with Prof Nønne Presle (University of Oulu) and Dr Kevin Wilson (Berkeley National labs) aim to further understand the partitioning behaviour of surfactants in confined volumes. An ongoing collaboration with Prof. Man Nin Chan (Chinese University of Hong Kong) aims to understand the physical properties of organosulphate aerosol.

McGill University — *Montreal, QC*

PhD Thesis Work — *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 collaboration with Prof. James Davies (UC, Riverside) this model was used to model the properties of Humic acid aerosol. 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. — *Vancouver, BC*

MITACS Accelerate Project — *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 — *Vancouver, BC*

MSc Thesis Work — *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 — *Ottawa, ON*

Undergraduate Honours Thesis Research Project — *2012*

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

Teaching Experience

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

Supervisory Teaching Assistant — *McGill University*

CHEM 377 & 493: Instrumental Analysis and Advanced Physical Chemistry Laboratory — *2021*

Teaching Assistant — *McGill University*

CHEM 110, 120, 345 & 493: General Chemistry I & II Laboratories, Quantum Chemistry, Advanced Physical Chemistry Laboratory — *2016 – 2019*

Teaching Assistant — *University of British Columbia*

CHEM 121, 123 & 315/323/335/345: General Chemistry I & II Laboratories & Integrated Chemistry Laboratories — *2013 – 2016*

Undergraduate Teaching Assistant *Carleton University*

CHEM 1101 & 3503: Chemistry for Engineers and Inorganic Chemistry I *2009 – 2013*

Research Support

McGill Sustainability Systems Initiative Ideas Fund *2020*

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

Publications

Peer Reviewed Publications

9. **A. Bain** "Buoyancy and Brownian motion of plastics in aqueous solution: Predictions and implications for density separation and aerosol internal mixing state" *Environmental Science: Nano*, 2022. Available online: http://www.doi.org/10.1039/D2EN00525E
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**, K. Ghosh, N. Prisle and B. R. Bzdek, Surface tension and partitioning of nonionic surfactants in picolitre droplets.

Theses

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.

Invited Talks

Department of Chemistry, Brock University

"Investigating aerosol physical properties at the single particle level", April 12, 2022.

Other Presentations

International Aerosol Conference

A. Bain and B. R. Bzdek, "Surface tension of surfactant containing aerosol droplets", September 6, 2022 (oral).

Molecular Understanding of Atmospheric Aerosol
A. Bain and B. R. Bzdek, "The surface tension of ternary aqueous mixtures containing nonionic surfactants in macroscopic solutions and picolitre droplets", May 16–19, 2022 (poster).

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

Early Career Scientist Travel Award | 2022
Awarded by the Aerosol Society to attend the International Aerosol Conference 2022.

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

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

Service and Outreach Activities

Research FUTURES | 2022
Designed and demonstrated outreach activities to introduce >250 school children to the concept of surface tension as part of the South West of England Research FUTURES Schools research fair outreach event.

CIC PTC - Virtual Seminar Committee | 2022
Organizing committee member for the Chemical Institute of Canada, Physical, Theoretical and Computational virtual seminar series.

Postdoctoral Research Seminar Series Co-chair | 2022
Co-chair for the postdoctoral research seminar series in the School of Chemistry, University of Bristol.

Equality, Diversity and Inclusion (EDI) Committee | 2022
Postdoctoral Representative on the University of Bristol, School of Chemistry EDI committee.

International Buddy Scheme | 2022
Buddy with the International Staff Buddy Scheme at the University of Bristol.

Postdoctoral Representative Physical and Computational Chemistry | 2022
Liaison between the Physical and Computational Chemistry section and the postdoctoral researcher community.

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