

# Dr. Alison Bain

ASSISTANT PROFESSOR OF CHEMISTRY

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## Education

### McGill University

DOCTOR OF PHILOSOPHY, CHEMISTRY

Montreal, QC

Sep. 2016 - May 2021

### University of British Columbia

MASTER OF SCIENCE, CHEMISTRY

Vancouver, BC

Sep. 2013 - Aug. 2016

### Carleton University

BACHELOR OF SCIENCE, HIGHEST HONORS, CHEMISTRY WITH A CONCENTRATION IN NANOTECHNOLOGY

Ottawa, ON

Sep. 2009 - May 2013

## Research Experience

### Oregon State University

ASSISTANT PROFESSOR

Corvallis, OR

Sep. 2023 - Present

### University of Oulu

VISITING SCIENTIST

Oulu, FI

May 2023

### University of Bristol

POSTDOCTORAL RESEARCH ASSOCIATE

Bristol, UK

May 2021 - Sep. 2023

### McGill University

PHD THESIS WORK

Montreal, QC

Sep. 2016 - April 2021

## Research Support

NATIONAL SCIENCE FOUNDATION - ENVIRONMENTAL CHEMICAL SCIENCE

2025 - 2028

**Alison Bain** "Surface Tension of Aerosol Droplets Containing Complex Mixtures of Organics" (PI Budget: \$400,000)

OREGON STATE UNIVERSITY TRANSDISCIPLINARY RESEARCH SEED FUND

2024 - 2025

Simone de Szoke, Alc Dye, Chris Still, Kristen Buck, **Alison Bain**, Kelsey Emard, Alex Levin, Kenneth Maes, John Kim, Nick Stiler and Kate Porche "Wildfire Smoke in the Pacific Northwest" (Co-I budget: \$1,524)

SIMONS FOUNDATION: SOLAR RADIATION MANAGEMENT PROGRAM

2024 - 2027

**Alison Bain**, James Davies and Thomas Preston "Single particle measurements of aerosols for inform solar radiation management" (CO-I budget: \$283,799)

AEROSOL SOCIETY CAREER DEVELOPMENT GRANT

2022 - 2023

**Alison Bain** "Characterizing the surface tension and surface partitioning of subpicolitre droplets" (PI budget: \$5,000)

MCGILL SUSTAINABILITY SYSTEMS INITIATIVE IDEAS FUND

2020 - 2021

Thomas Preston and **Alison Bain** "The effect of microplastics on cloud droplet formation" (Project Budget: \$50,000)

## Publications

Members of the Bain Aerosol Research Group are **bolded**, undergraduate researchers are underlined, and the corresponding author is noted with a \*.

### Peer Reviewed Publications

21. **E. K. Werner**, O. Wasserlein, C. Mahan, A. Zuend, and **A. Bain**\* "Impact of nonionic surfactants on the water activity of binary and ternary aqueous solutions", *Physical Chemistry Chemical Physics*, Available Online: <https://doi.org/10.1039/D5CP03917G>.
20. **E. Anizoba**, **A. Bain**, and V. T. Remcho\*, "Determining the Hydrodynamic Diameters of Nanoplastics via Short-End Capillary Zone Electrophoresis- Taylor Dispersion Analysis in Tandem" *Analyst*, 2025, 150, 4359 - 4366.
19. **K. Ramos**, **E. K. Werner**, Bzdek, B. R., and **A. Bain**\*, "Measurements and model predictions for the surface tension of aerosol droplets containing mixtures of strong nonionic surfactants and organic solutes" *Environmental Science and Technology*, 2025, 59, 35, 18761 - 18770.
18. B. Vennes, **A. Bain**, J. F. Davies and T.C. Preston\*, "Optimizing Stratospheric Aerosol Lifetime and Albedo through Particle Morphology and Refractive Index." *Environmental Science: Atmospheres*, 2025, 5, 998 - 1013. (Published as part of the Solar Radiation Management Special Collection).
17. **A. Bain**\*, K. Ghosh, K. Tumashevich, N. L. Prisle, and B. R. Bzdek\*, "Surfactant partitioning in aerosol droplets containing ionic surfactants and glutaric acid, NaCl or sea salts" *Atmospheric Chemistry and Physics*, 2025, 25 (11), 5633 - 5645.

16. **E. Werner, M. Hammond** and **A. Bain**\*, “Surface tension predictions during hygroscopic growth and cloud droplet activation using a simple kinetic surfactant partitioning model” *Aerosol Science and Technology*, 2025, 59 (7), 781 – 793. (Virtual Special Collection: Advancing Aerosol Science through Early Career Research).
15. **A. Bain**, N. L. Prisle and B. R. Bzdek\*, “Comparing kinetic and thermodynamic partitioning models to predict the surface tension of aerosol droplets containing nonionic surfactants” *ACS Earth and Space Chemistry*, 2024, 8, 11, 2244 – 2255.
14. **A. Bain**\*, “Recent advances in experimental techniques for investigating aerosol surface tension” *Aerosol Science and Technology*, 2024, 58, 11, 1213 – 1236.
13. **A. Bain**, L. Lalemi, N. C. Dawes, R. Miles, A. Prophet, K. Wilson and B. R. Bzdek\*, “Surfactant partitioning dynamics in freshly generated aerosol droplets” *Journal of the American Chemical Society*, 2024, 146, 23, 16028 – 16083.
12. **A. Bain**, K. Ghosh, N. L. Prisle\* and B. R. Bzdek\*, “Surface-area-to-volume ratio determines surface tensions in microscopic, surfactant-containing droplets” *ACS Central Science*, 2023, 9, 11, 2076 – 2083.
11. **A. Bain**, M. N. Chan and B. R. Bzdek\*, “Physical properties of short chain aqueous organosulfate aerosol” *Environmental Science: Atmospheres* 2023, 3, 1365-1373.
10. A. Rafferty, B. Vennes, **A. Bain**, and T. C. Preston\*, “Optical trapping and light scattering in atmospheric aerosol science” *Physical Chemistry Chemical Physics*, 2023, 25, 7066 – 7089.
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, 9, 4249 – 4254.
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 Under Review

2. L. Zink\*, E. G. Xu, S. M. Brander, **A. Bain**, B. C. Almroth, and M. G. Bertram “Primer: Novel Entities” *Current Biology*, Under Review.
1. **M. Hammond**, Q. Ke, A. Deshwal, C. Simon\* and **A. Bain**\*, “Adaptive, Bayesian experimental design to efficiently determine the critical micelle concentration of a surfactant” *Langmuir*, Under Review. Preprint: 10.26434/chemrxiv-2025-72q6h

## Invited Talks

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### Surface Tension Colloquium

“Surface tension of aerosol droplets containing strong surfactants and surfactant mixtures”, Aug. 27, 2025.

### C&EN Talented 12 Symposium at Fall 2025 ACS

“My journey to the stratosphere”, Aug. 18, 2025.

### Aerosol Science and Technology Virtual Lecture Series

“Recent advances in experimental techniques for investigating aerosol surface tension”, April 16, 2025.

### Department of Chemistry and Chemical Biology, McMaster University

“Surfactant partitioning in aerosol droplets and impact on cloud droplet activation”, Aug. 26, 2024.

### Department of Chemistry and Biochemistry, Boise State University

“Using single-particle spectroscopy to measure aerosol physical properties inaccessible with bulk-phase techniques”, Oct. 20, 2023.

### Center for Atmospheric Research (ATMOS), University of Oulu

“Single particle investigations of aerosol physical properties”, May 12, 2023.

### Postdoctoral Seminar Series, School of Chemistry, University of Bristol

“Atmospheric microplastics and their impact on aerosol properties”, Jan. 27, 2023.

### Energy and Environment Seminar Series, School of Chemistry, University of Bristol

“What is the surface tension of aerosol?”, November 23, 2022.

## Other Presentations

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### **Pacifichem**

**A. Bain** “Predicting the surface tension of aerosol droplets containing surfactant mixtures”, Dec 15, 2025. (oral)

### **American Chemical Society Annual Fall Meeting**

**A. Bain** “Size-dependent mixed surfactant partitioning in aerosol droplets”, August 19, 2025. (oral)

### **Atmospheric Chemistry Gordon Research Conference**

**A. Bain**, Emily Werner, Owen Wasserlein, Makaila Hammond and Cassidy Mahan “The impact of surfactants on the surface tension and water activity of aerosol droplets”, August 4-5, 2025. (poster)

### **American Association for Aerosol Research**

**A. Bain**, K. Ghosh, K. Tumashevich, N. Prisle and B. Bzdek “Investigating the Impact of Sea Water Divalent Cations on the Surface Tension of Aerosol Containing Ionic Surfactants”, October 25, 2024. (oral)

### **American Association for Aerosol Research 2024**

M. I. Quant, **A. Bain**, J. Walker, B. Bzdek “Time-Resolved Picoliter Droplet Surface Tensions over Microsecond to Millisecond Timescales”, Oct 23, 2024.

### **European Aerosol Conference**

B. Bzdek, **A. Bain**, K. Ghosh and N. L. Prisle “Surface-Area-to-Volume Ratio Determines Surface Tensions in Microscopic, Surfactant-Containing Droplets”, Aug 27, 2024.

### **Industry-University Collaborative Conference Program**

E. E. Anizoba, **A. Bain** and V. Remcho “Determination and Characterization of Pharmaceuticals Sorbed onto the Surface of Nanoplastics using Capillary Electrophoresis”, April 5, 2024.

### **Industry-University Collaborative Conference Program**

M. Hammond, and **A. Bain** “The Impact of Aerosol on the Environment”, April 5, 2024.

### **Molecular Understanding of Atmospheric Aerosol**

**A. Bain**, L. Lalemi, N. Croll Dawes, M. Miles, A. Prophet, K. Wilson and B. R. Bzdek, “Investigating the Dynamic Surface Composition of Aerosol Droplets”, April 4, 2024 (oral).

### **IGAC-iCACGP ERC Online Conference**

**A. Bain**, Man Nin Chan and B. R. Bzdek, “Physical Properties of Aerosol Containing Short Chain Organosulfates”, November 17, 2023 (poster).

### **American Association for Aerosol Research Conference**

**A. Bain**, Kunal Gosh, Nønne Prisle and B. R. Bzdek, “Quantifying the Surface Tension of Aerosol through Single Droplet Measurements and Modeling Surfactant Partitioning”, October 4, 2023 (oral).

### **Atmospheric Chemistry Gordon Conference**

**A. Bain**, L. Lalemi, N. Croll Dawes, I. Quant, A. Prophet, K. Wilson and B. R. Bzdek, “Investigating surface tension dynamics in freshly formed droplets”, July 31, 2023 (poster).

### **Atmospheric Chemistry Colloquium for Emerging Senior Scientist - ACCESS XVII**

**A. Bain**, “Determining the surface tension of aerosol through single droplet measurements and modeling surfactant partitioning”, July 29, 2023 (oral).

### **Annual Aerosol Society Conference**

**A. Bain** and B. R. Bzdek, “The impact of nonionic surfactants on aerosol surface tension”, November 17, 2022 (oral).

### **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

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### **James H. Krueger Faculty Teaching Award | 2025**

Awarded by the Department of Chemistry at Oregon State University to recognize my ability to provide an effective learning environment and sustained dedication to teaching.

### **Research Advancement Academy Fellow | 2025 – 2026**

Awarded by Oregon State University to further develop research leadership skills.

### **C&EN Talented 12 | 2025**

Award for Early Career Chemists and Chemical Engineers leading their subfield, using chemistry to make real-world impact.

### **ACCESS XVII Attendee | 2023**

Awarded a funded spot at ACCESS XVII, seventeenth atmospheric chemistry colloquium for emerging senior scientists sponsored by Brookhaven National Labs and the Atmospheric Chemistry Gordon Conference.

### **NSERC PDF | 2023**

Natural Sciences and Engineering Research Council of Canada (NSERC) Postdoctoral Fellowship (PDF) holder.

### **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.

## Professional Development

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### **Teaching with AI Learning Community | 2025**

Developed strategies for designing assessments that guide ethical use of AI.

### **Difference Power and Oppression Academy I and II | 2024**

Developed strategies for course design and implementation of concepts related to difference, power, and oppression into the undergraduate chemistry curriculum.

### **Entering Mentorship Workshop | 2024**

Developed strategies for effective mentoring of graduate students. Earned the ‘Trained Mentor Badge’.

## Teaching

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**CH 660** Winter 2025 - Spectrochemical Analysis (13 students)

**CH 324** Winter 2024 - Quantitative Analysis Laboratory (42 students)

**CH 421/521** Fall 2023, 2024, 2025 - Analytical Chemistry 1 (41 students)

**CH 401** Fall 2023, Winter 2024, Winter, Spring, Fall 2025, Winter 2026 - Undergraduate Research (1-2 students)

## Service and Outreach Activities

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### **OSU SMILE Program | 2025 – Present**

Partner with the Science & Math Investigative Learning Experiences (SMILE) program and teachers to develop classroom activities to teach middle and high school students in rural Oregon about analytical and atmospheric chemistry.

**Session Co-Chair AAAR | 2024 – Present**

Co-chair of technical sessions at the American Aerosol Society Annual meetings in 2024 and 2025.

**Graduate Admission Committee | 2023 – Present**

Review Graduate School Applications for the Analytical track in the Department of Chemistry.

**Academic Advisor | 2023 – 2025**

Academic advisor to three undergraduates with a major in Chemistry at Oregon State University.

**CIC PTC - Virtual Seminar Committee | 2022 – 2024**

Organizing committee member for the Chemical Institute of Canada, Physical, Theoretical and Computational virtual seminar series.

**Research FUTURES: Discover and Discuss | 2023**

Designed in class outreach activity to be demonstrated by the teacher and introduce school children to the concept of surface tension as part of the South West of England Research FUTURES Discover and Discuss program.

**Postdoctoral Research Seminar Series Co-chair | 2022 – 2023**

Co-chair for the postdoctoral research seminar series in the School of Chemistry, University of Bristol.

**Research FUTURES: Student Research Fair | 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.