Hayden Robertson

PhD Candidate · Discipline of Chemistry

University of Newcastle, University Dr, Callaghan, NSW 2308, Australia

hrobertson1@uon.edu.au | hrobertson.info | haydenrobertson | haydenrob | haydenrobertson

Education

University of Newcastle — *Callaghan, Australia*

PhD Chemistry — *2020 - present*

- UON Supervisors: Prof Erica Wanless and Prof Grant Webber
- ANSTO Supervisor: Dr Andrew Nelson

University of Newcastle — *Callaghan, Australia*

Bachelor of Science, Honours in Chemistry — *2019*

- Supervisors: Prof Erica Wanless and Prof Grant Webber
- University Medal recipient

University of Newcastle — *Callaghan, Australia*

Bachelor of Science / Bachelor of Mathematics — *2015 - 2018*

- Majors in chemistry and pure mathematics
- Faculty of Science Medal recipient

Publications

H. Robertson, A. R. J. Nelson, S. W. Prescott, G. B. Webber, and E. J. Wanless, Cosolvent effects on the structure and thermoresponse of a polymer brush: PNIPAM in DMSO–water mixtures, *Polym. Chem.* (Trends in Thermoresponsive Polymers: from Chemistry to Applications), 2023, **14**, 1526-1535. DOI: 10.1039/D2PY01487D.

First work to characterise a PNIPAM brush in DMSO-water mixtures, a common cryopreservant; reveals brush structure in non-aqueous solvent mixtures.

H. Robertson, J. D. Willott, K. P. Gregory, E. C. Johnson, I. J. Gresham, A. R. J. Nelson, V. S. J. Craig, S. W. Prescott, R. Chapman, G. B. Webber and E. J. Wanless, From Hofmeister to hydrotrope: Effect of anion hydrocarbon chain length on a polymer brush, *J. Colloid Interface Sci.*, 2023, **634**, 983–994. DOI: 10.1016/j.jcis.2022.12.114.

Investigated the role of anion hydrophobicity on the manifestation of specific ion effects on PNIPAM brush thickness and structure; indirectly probing change in hydrophobic hydration.

H. Robertson, I. J. Gresham, S. W. Prescott, G. B. Webber, E. J. Wanless and A. Nelson, *refellips*: A Python package for the analysis of variable angle spectroscopic ellipsometry data, *SoftwareX*, 2022, **20**, 101225. DOI: 10.1016/j.softx.2022.101225.

Open source software for the analysis of ellipsometry data. First package capable of 'co-refining' ellipsometry data with neutron and X-ray reflectivity data. First publication for the *SPATZ* neutron reflectometer at ANSTO.

K. P. Gregory, G. R. Elliott, **H. Robertson**, A. Kumar, E. J. Wanless, G. B. Webber, V. S. J. Craig, G. G. Andersson and A. J. Page, Understanding specific ion effects and the Hofmeister series, *Phys. Chem. Chem. Phys.*, 2022, **24**, 12682–12718. DOI: 10.1039/D2CP00847E.

A review of the latest developments in unravelling the dominant drivers behind specific ion effects.

B. T. Lobel, **H. Robertson**, G. B. Webber, P. M. Ireland and E. J. Wanless, Impact of Surface Free Energy on Electrostatic Extraction of Particles from a Bed, *J. Colloid Interface Sci.*, 2022, **611**, 617–628. DOI: 10.1016/j.jcis.2021.12.117.

Investigated the influence of surface free energy on the electrostatic particle extraction from a bed using silane modified glass particles.

I. J. Gresham, T. J. Murdoch, E. C. Johnson, **H. Robertson**, G. B. Webber, E. J. Wanless, S. W. Prescott and A. R. J. Nelson, Quantifying the robustness of the neutron reflectometry technique for structural characterization of polymer brushes, *J. Appl. Crystallogr.*, 2021, **54**, 739–750. DOI: 10.1107/s160057672100251x.
Tailored approach to modelling neutron reflectometry data of a polymer brush; parallel tempered Markvo chain Monte Carlo simulations are employed to obtain a spread of potential fits.

H. Robertson, E. C. Johnson, I. J. Gresham, S. W. Prescott, A. Nelson, E. J. Wanless and G. B. Webber, Competitive specific ion effects in mixed salt solutions on a thermoresponsive polymer brush, *J. Colloid Interface Sci.*, 2021, **586**, 292–304. DOI: 10.1016/j.jcis.2020.10.092.
Investigated the modulation in swelling and structure of a POEGMA brush in mixed electrolytes.

Awards

2021 **Ezio Rizzardo Polymer Scholarship**, Australian Academy of Technological Sciences and Engineering

2020 **Post Graduate Research Award**, Australian Institute of Nuclear Science and Engineering
Vice Chancellor's HDR Training Scholarship, University of Newcastle

2019 **Masson Memorial Scholarship Prize**, Royal Australian Chemical Institute
Honours Scholarship, Australian Institute of Nuclear Science and Engineering

2017 **R K Whiteley Prize in Surface Chemistry**, Whiteley Corporation
RACI Prize in Chemistry, Royal Australian Chemical Institute
Third Year Physical Chemistry Award, University of Newcastle

2016 **New Colombo Plan Mobility Grant**, Department of Foreign Affairs and Trade, Australian Government.
Fully funded two week summer school (FCISC) at the University of Science and Technology, Hefei, China.

Grants

since 2018 **Neutron reflectometry beamtime: *Platypus***, ANSTO *106 days*
Neutron reflectometry beamtime: *Spatz*, ANSTO *24 days*

since 2018 **X-ray reflectometry beamtime**, ANSTO *33 days*

since 2021 **X-ray absorption spectroscopy beamtime**, ANSTO *4 days*

Presentations

Invited Talks

June 2022. *refellips: Ellipsometry data analysis in Python*. Invited talk: Open Reflectometry Standards Organisation Workshop, virtual, international.

Oral Presentations

February 2023. The role of the solvent in specific ion effects: PNIPAM brushes in non- aqueous electrolytes. *Australian Colloid and Surface Science Student Conference*, Melbourne. Outstanding oral presentation award.

December 2022. The role of the solvent in specific ion effects: PNIPAM brushes in non-aqueous electrolytes. *17th Pacific Polymer Conference*, Brisbane.

November 2022. *refnx* + *refellips*: Analysing neutron/X-ray/light scattering from surfaces in Python. *ANBUG - AINSE Neutron Scattering Symposium*, ANSTO, Lucas Heights.

June 2022. The role of the solvent in specific ion effects: PNIPAM brushes in non-aqueous electrolytes. *17th Conference of the International Association of Colloid and Interface Scientists*, Brisbane.

May 2022. *refellips*: Ellipsometry data analysis in Python. *Sydney Surfaces and Soft Matter Meeting*, UNSW, Sydney.

February 2022. Salty seaweed: the influence of ion hydrophobicity on specific ion effects. *Australian Colloid and Surface Science Student Conference*, Newcastle. Outstanding oral presentation award.

February 2022. Salty seaweed: the influence of ion hydrophobicity on specific ion effects. *Australian Centre for Neutron Scattering Clip Day*, ANSTO, Lucas Heights.

June 2021. Short chain fatty acids & polymers: the salty seaweed you don't eat. *Sydney Surfaces and Soft Matter Meeting*, UNSW, Sydney.

February 2021. Unravelling specific ion effects: A neutron reflectometry study of thermoresponsive polymer brushes in complex environments. *Australian Centre for Neutron Scattering Clip Day*, ANSTO, Lucas Heights. Best oral presentation award.

November 2020. Competitive specific ion effects: A neutron reflectometry study of thermoresponsive polymer brushes in mixed electrolytes. *ANBUG - AINSE Neutron Scattering Symposium*, Virtual.

June 2020. Competitive specific ion effects: The behaviour of thermoresponsive polymer brushes in mixed electrolytes. *Sydney Surfaces and Soft Matter Meeting*, Virtual.

Poster Presentations

October 2021. Short chain fatty acids and polymers: specific ion effects on the behaviour of responsive polymer brushes. *Polymer Brushes: New Developments and Perspectives in Experiment, Theory and Applications*, virtual, international.

February 2021. Specific ion effects on the behaviour of thermoresponsive polymer brushes. *Australian Colloids and Interface Society Conference*, Virtual. Best poster award.

January 2020. Behaviour of Thermoresponsive Polymer Brushes in Mixed Electrolytes. *Australian Colloid and Surface Science Student Conference*, Gippsland.

May 2019. Effects of Mixed Salt Solutions on Thermo-responsive Polymers. *Sydney Surfaces and Soft Matter Meeting*, UNSW, Sydney.

July 2019. Effects of Mixed Salt Solutions on Thermoresponsive Polymers. *Royal Australian Chemical Institute Polymer Group ECR and Postgraduate Symposium*, University of Sydney, Sydney.

Outreach & Professional Development

Science Communication

2019 **Presentation and interview with AINSE director**, AINSE Councillors General Meeting

2021 ***The Polymer Brush Solution***, COSMOS Briefing interview

2021 **Interview on *Mornings* with Kia Handley**, ABC Radio

2021 ***It's all about the interface with multi-use polymer brushes***, ANSTO blog and interview

2022 ***refnx & refellips: Pushing the boundaries of polymer brush research***, AINSE Annual Report

Development

2018 **AINSE Winter School**, ANSTO *Sydney, Australia*

2019 **ANSTO-HZB Neutron School**, ANSTO *Sydney, Australia*

Professional Memberships

since 2021	**Royal Society of Chemistry**, Associate member	*RSC*
since 2020	**Australasian Colloid and Interface Society**, Student member	*ACIS*
since 2020	**Australian Institute of Physics**, Student member	*AIP*
since 2020	**Australian Neutron Beam Users Group**, Student member	*ANBUG*
since 2018	**Australian Young Generation in Nuclear**, Postgraduate student member	*AusYGN*
since 2018	**Royal Australian Chemical Institute**, Postgraduate student member	*RACI*