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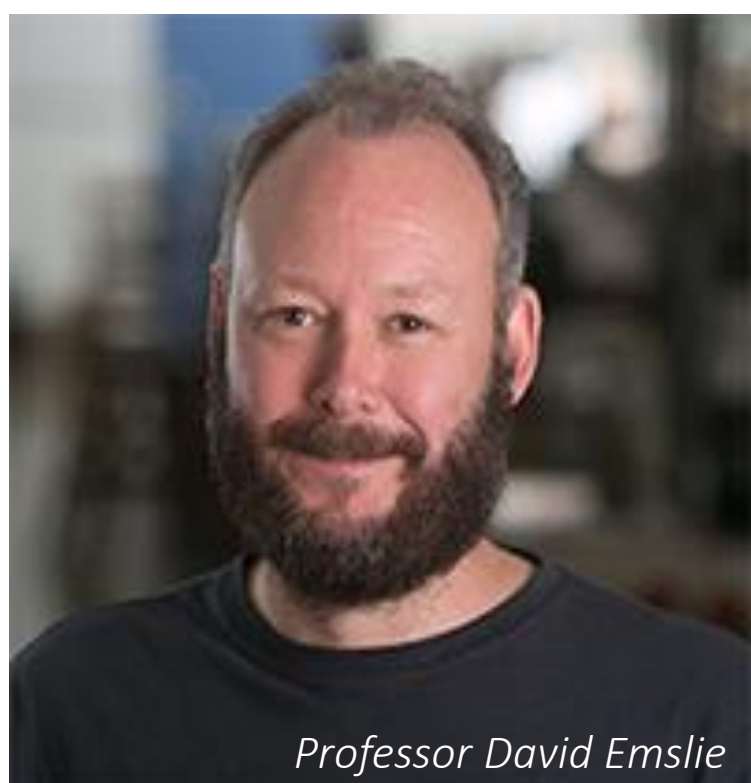
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EXECUTIVE SUMMARY YEAR 1 PROGRESS

Welcome to the first edition of our ORF-RE Project newsletter. The end of year 1 is rapidly approaching, and since the end of February 2019, when funding became available, there has already been a lot of activity.

A critical initial step for the project is construction and programming of the new ALD reactors, and this is well underway. Orders have been placed for all of the large and most of the small items, the majority of these have been received, and the first round of orbital welding is complete. Larger items include hazardous gas cabinets, a vented enclosure for the reactors, dry vacuum pumps, an abatement system, and ovens to house the reactors and heated bubblers. Smaller items include Conflat and VCR valves, fittings, feedthroughs, flanges and components (including 65 manual valves and 68 pneumatically actuated diaphragm valves), 30 mass flow controllers, a lot of stainless steel tubing, solenoid manifolds, 2" diameter substrate heaters mounted on a CF flange, racks, computers, various National Instruments hardware, ALD bubblers, vacuum gauges, regulators, gas purifiers, and gas sensors. The goal is for the ORF-RE ALD reactors to be operational in October, and tested and ready for use shortly after. Furthermore, a prototype ALD reactor from one of our industry partners is anticipated to be available for installation in October.



Professor David Emslie

Assembling the team of graduate students and PDFs is the next step, and many co-applicants already have a student working on the project, or have one lined up to start in September of this year. A PDF focused on ALD reactor experiments (especially those involving the various collaborations in the ORF-RE project) will also be hired to start in October, to correspond to the point in time when the ALD reactors are fully constructed. Furthermore, several new students and PDFs have already been hired. Our newest additions include Declan Dejordy (MSc), Kasuni Wedisinghe (MSc) and Dr. Kevin Yu (PDF) who joined the Emslie group in Sept 2018, Jan 2019 and June 2019, and Cameron Naraine (M.A.Sc.) and Tyler Kashak (M.A.Sc.) who joined the Bradley and Xu groups within the past year, respectively. More details on the students and PDFs currently working on the ORF-RE project are provided on page 3 and 4.

Other announcements are: Professor Gianluigi Botton has moved to Saskatoon to become the Senior Science Director at the Canadian Light Source. Congratulations! He will maintain his research group at McMaster University, and will continue the ORF-RE collaboration as planned. In addition, Dr. Blossom Yan has been working as the ORF-RE project manager since mid-June 2019. Welcome! The website for the ORF-RE project is also now on-line at <https://emsliegroupp.mcmaster.ca/orf-re>.

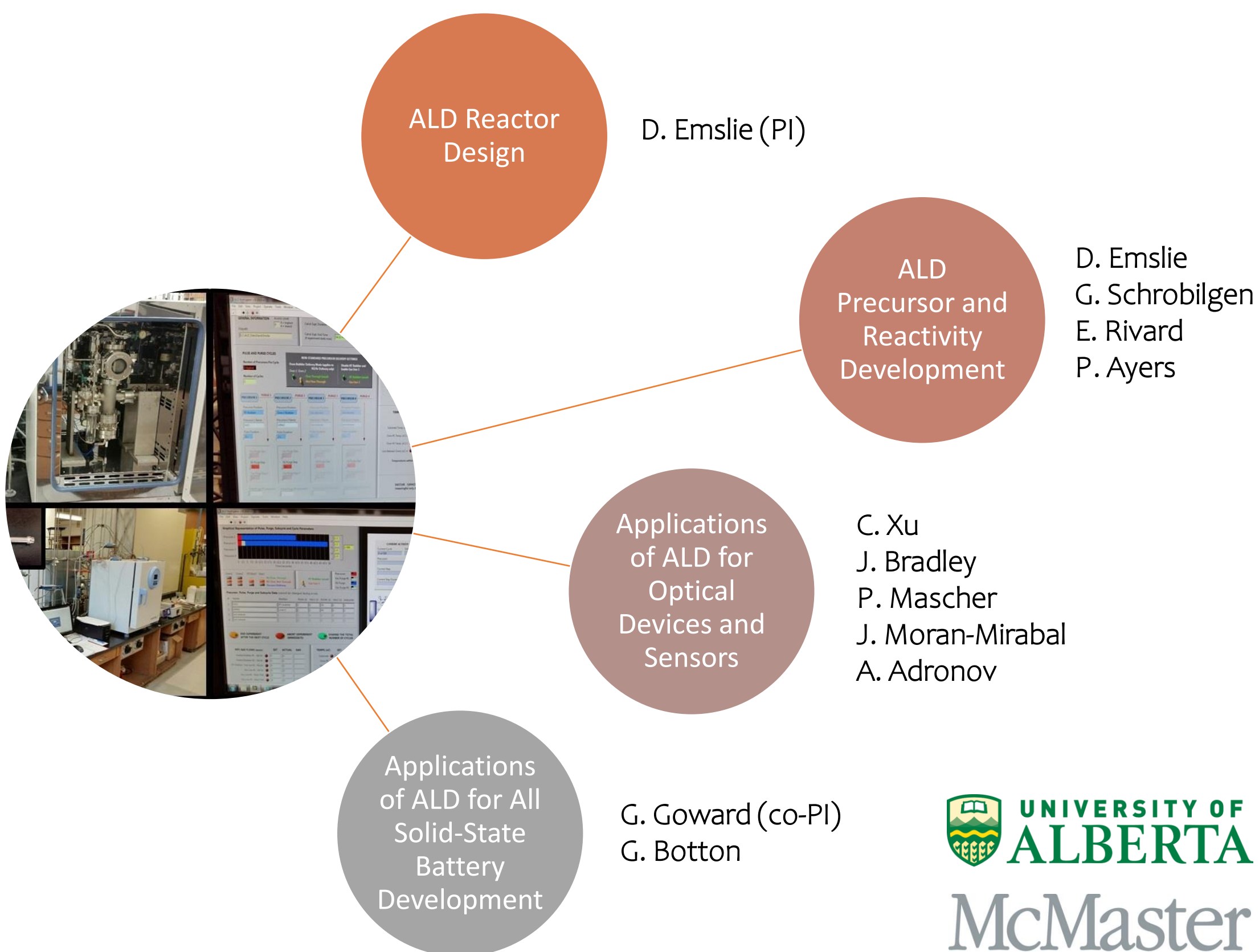
David Emslie
Principal Investigator

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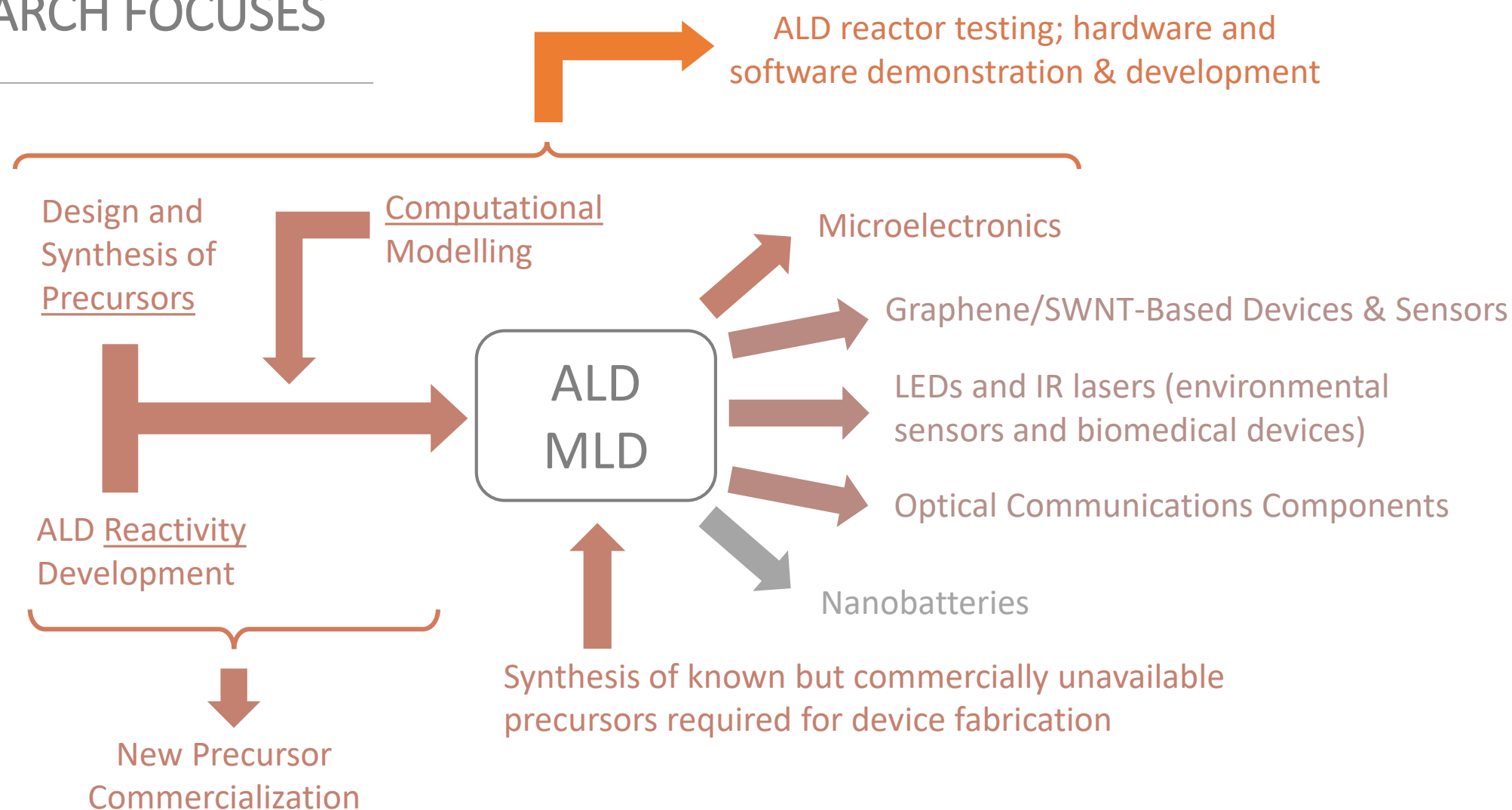
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OUR NETWORK



RESEARCH FOCUSES



STUDENTS AND POSTDOCS

ALD Precursor and Reactivity Development

Kasuni Wedisinghe received her B. Sc. in Chemistry from the University of Kelaniya in Sri Lanka, and started as a graduate student in January 2019. Her research is focused on unique ALD reactivity and method development.

Kevin Yu graduated with his Ph. D. from Shantou University in China, in 2018. He was a visiting Ph.D. student in the Emslie group for a year in 2017-2018, and joined the Emslie group as a postdoctoral fellow in June 2019. His research centres around the development of novel co-reactants for transition metal ALD.

Majeda Al Hareri obtained her B. Sc. in Chemistry from Brock University, and started as a graduate student in Sept 2016. She was awarded an NSERC PGS-D in 2018. Her research is focused on main group element and metal oxide ALD.



Declan working in the Glovebox

Declan DeJordy received his B. Sc. in Chemistry from the University of Guelph. He started in the Emslie group in September 2018. His research targets highly-reactive new organometallic ALD precursor molecules.

Jocelyn Sinclair obtained her B. Sc. in Chemistry from Dalhousie University. She is currently a graduate student in the group of Eric Rivard at the University of Alberta. Her research involves group 14 complexes and their applications in thin film deposition.



Optical and Electrical Device Fabrication and Characterization

Josh Kneller obtained his B.Sc. in Engineering Physics at McMaster University, and he joined the Xu Group in 2017 working towards his Ph. D. His research focuses on development and applications of mid-IR lasers.

Tyler Kashak obtained his B.Sc. in Engineering Physics at McMaster University, and he joined the Xu Group in 2019 as a M. A. Sc. student. His research focuses on development and applications of compact solid state lasers.

Annica Freytag obtained her M. Sc. from Queen's University in Chemistry. She joined the Goward group in 2015 as a Ph.D. student. Her research focuses on advancing techniques for in-situ monitoring of full electrochemical cells.

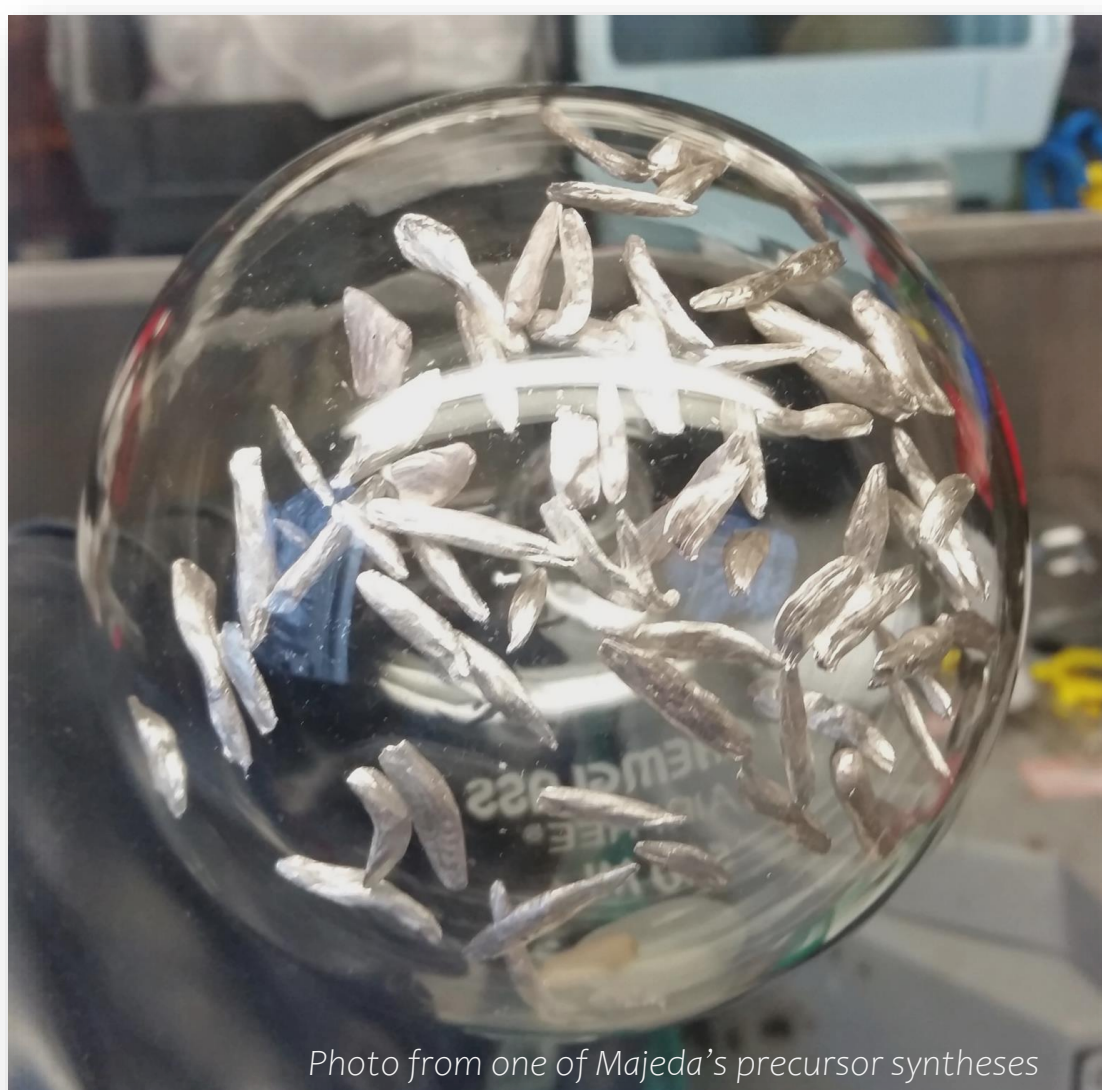


Photo from one of Majeda's precursor syntheses



Colourful ALD coated Si wafers

Khadijeh Miarabbas Kiani received her Masters degree in Electrical Engineering, Electronics, from Shiraz University, Iran. She joined the Bradley Group as a Ph. D. student, studying photonics, silicon photonics, nanophotonics, etc.

Jeremy Miller completed his B. Eng in Engineering Physics with high distinction in 2013 from Carleton University, and is currently undertaking his Ph. D. in the Bradley Group. His research interests include silicon photonics, thin films, and rare earths.

Cameron Naraine received his B.Sc. in Honours Physics from Wilfrid Laurier University in 2018 and is now a M.A.Sc. student in Engineering Physics at McMaster University. His research interests include design and simulation of silicon photonics systems.

Xiuping Ding joined the Moran-Mirabal group as a Ph. D. student in 2016, and continues to work on the development of stretchable electronic devices and solar cells.

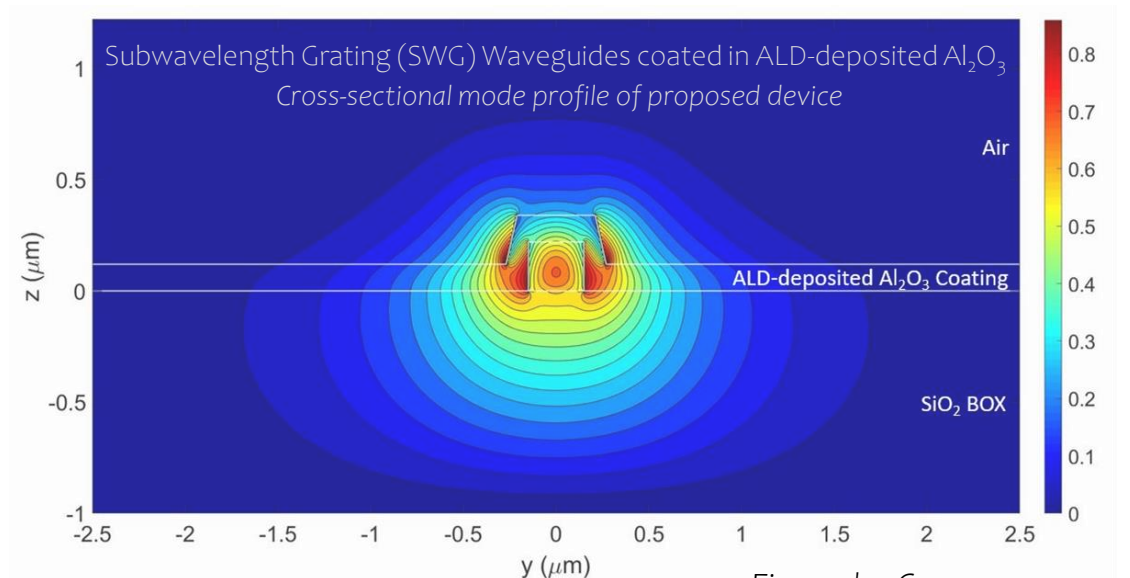


Figure by Cameron

RECENT EVENTS

ORF Project Management Meetings

The first meetings of the various ORF committees took place earlier this year.

McMaster ALD Precursor and Reactivity Development Subgroup

Spring, 2019 at McMaster University
Chaired by: D. Emslie

Thank you to all participants!



UPCOMING EVENTS

Year 1 Welcome & Kick-Off Social

Fall, 2019 at McMaster University
Chaired by: D. Emslie and B. Yan
Agenda: Introduction and ALD reactors tour, followed by drinks at the Phoenix.

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ORF Website (NEW!):
<https://emsliegroupp.mcmaster.ca/orf-re>

ACKNOWLEDGEMENTS

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