ORF-RE PROJECT NEWSLETTER

Enabling Next-Generation Devices through Novel Molecule-Based Thin Film Deposition Methods and Advanced Characterization of Structure and Function

Issue 4, June 2022

EXECUTIVE SUMMARY

YEAR 4 Progress

Through the hard work of our students and researchers, the ORF-RE project has continued to make excellent progress towards the project milestones, despite knock-on effects from COVID-19 restrictions in Years 2 and 3.

During Year 4 the ORF-RE project has yielded new science and academic collaborations in all three research areas. This was achieved by bringing in top graduate students and PDFs to McMaster University and Ontario, developing infrastructure with technology-enabling capabilities which are unique in Ontario and Canada, continued academic collaborations and new partnerships with industry, providing training in cutting-edge technology focused research, graduation of uniquely-capable researchers, and increased visibility of unique technology-focused research and capabilities at McMaster and in Ontario. The combined efforts of the research team have generated numerous peer-reviewed publications, conference presentations, patents, invention disclosures, and an application for seed funding to commercialize research results through a spin-off company. Further information regarding some of our publications in Year 4 can be found in the Gallery and Additional Publications sections on pages 2 and 4, respectively. A full list of publications and conference presentations from Year 4 can be found on our website (link on page 4).

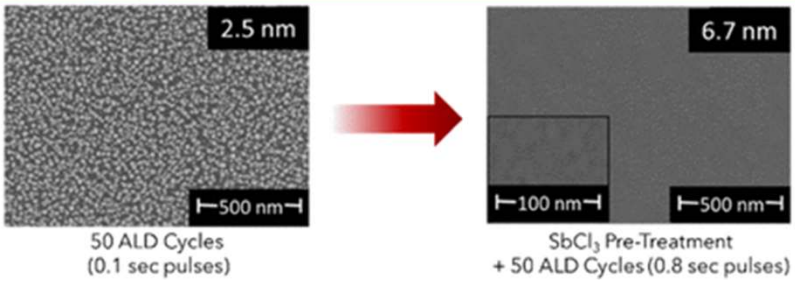
In addition to research output, ORF team members have shown a commitment to taking part in youth and public outreach events. For example, members of the Moran-Mirabal group developed an educational module on nanotechnology and society that will be delivered at high school outreach events. Also, multiple graduate students across all disciplines of the ORF took part in outreach events such as Magic of Molecules and the Bay Area Science and Engineering Fair.

We welcomed new undergraduate and graduate students, as well as a new postdoctoral researcher, to our ORF team in Year 4. Several students also graduated and are now utilizing their unique set of experiences and skills to further their career goals. Additional detail on team members that began or ended their work on the ORF project in Year 4 is provided on page 3. A McMaster Engineering news story also reported on a graduating team member – Khadijeh Miarabbas Kiani – and her ORF-related research. The link to this story can be found on page 4.

David Emslie

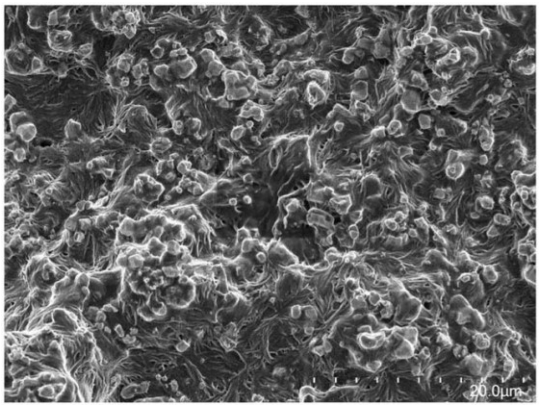
GALLERY

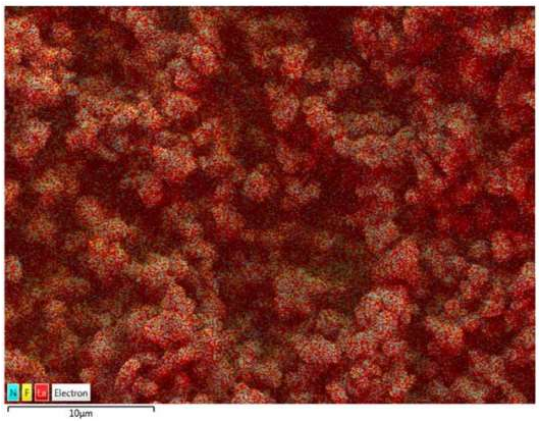
Room-temperature ALD of elemental antimony. M. Al Hareri, D. J. H. Emslie, *Chem. Mater.* **2022**, *34*, 2400.



Efficient multi-material structured thin film transfer to elastomers for stretchable electronic devices. X. Ding, J. Moran-Mirabal, *Micromachines* **2022**, *13*, 334.

A ceramic rich quaternary composite solid-state electrolyte for solid-state lithium metal batteries. H. Al-Salih, M. Cui, C.-H. Yim, Z. Sadighi, S. Yan, Z. Karkar, G. R. Goward, E. A. Baranova, Y. Abu-Lebdeh, *J. Electrochem. Soc.* **2022**, *169*, 080510.





Lasing in a hybrid rare-earth silicon microdisk. K. Miarabbas Kiani, C. M. Naraine, D. B. Bonneville, A. P. Knights, J. D. B. Bradley, *Laser Photonics Rev.* **2022**, *16*, 2100348.

STUDENTS AND POSTDOCS

New Members in Year 4

Kevin Sanders began his ORF-related postdoctoral research in the Goward group in 2021. His work involves development of solid-state batteries.

Ali Atwi obtained his BSc in mechanical engineering at American University of Beirut in Lebanon. He began his MSc degree in the Xu group in 2021. His research focuses on diode pumped solid state lasers.

Avesta Ahmadi obtained a BSc from Sharif University of Technology in 2015 and obtained a MSc at McMaster after joining the Protas group in 2018. Currently a PhD student in the Computational Science and Engineering program, Avesta's research focuses on mathematical and computational modelling of electrochemical systems.

Aysegul Abdelal obtained 2 MSc degrees from Bilkent University in Turkey and Western University. Her PhD research in the Mascher group concerns the electrical and mechanical characterization of silicon-containing thin films utilizing novel carbon sources.

Mengyang Cui is a PhD student in the Goward group. His research focuses on the development of solid-state batteries.

Clayton Vrenjak is an undergraduate researcher in the Xu group. His research focuses on mixed gas detection.

Metal precipitate from a solution-state reactivity test.

Recently Graduated Members

Kevin Yu, PDF – Departed in 2022, currently working in Hamilton, ON

Joceyln Sinclair, PhD – Graduated in 2022 from the Rivard group, currently working at Canadian Science Publishing

Christina McCabe, BSc– Completed undergraduate thesis in the Emslie group, currently working at McGill University

Amanda Ciezki, MSc – Graduated in 2022 from the Goward group, currently working in Hamilton, ON

Malaika Hussain, BSc – Completed undergraduate thesis in the Goward group

Xiuping Ding, PhD – Graduated in 2022 from the Moran-Mirabal group

Kasuni Wedisinghe, MSc – Graduated in 2022 from the Emslie group, currently working at Toronto Research Chemicals

Khadijeh Miarabbas Kiani, PhD – Graduated in 2022 from the Bradley group

EVENTS & PUBLICATIONS

ADDITIONAL PUBLICATIONS

D. J. H. Emslie, *et al. Can. J. Chem.* **2022**, *100*, 704.
https://doi.org/10.1139/cjc-2022-0103

J. D. B. Bradley, *et al. Appl. Sci.* **2022**, *12* (3), 1363.
https://doi.org/10.3390/app12031363

B. Protas, *et al. Phys. Rev. E* **2022**, *106*, 025313.
https://doi.org/10.1103/PhysRevE.106.025313

Seeing the light: Research breakthrough by McMaster PhD student creates a simple, cost-effective laser on silicon
https://brighterworld.mcmaster.ca/articles/laser-on-silicon-khadijeh-miarabbas-kiani/

For a full list of ORF-RE publications from Year 4, check out our website!

ACKNOWLEDGEMENTS

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UPCOMING EVENTS

ALD Reactor Tours

Available upon request

Contact M. Al Hareri

2nd ORF-RE Mini-Symposium

Spring/Summer of Year 5

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