

EXECUTIVE SUMMARY

| 1

GALLERY

| 2

STUDENTS & POSTDOCS

| 3

RECENT EVENTS

| 4

ADDITIONAL PUBLICATIONS

| 4

EXECUTIVE SUMMARY

YEAR 5 Progress

The ORF team has made excellent progress during Year 5, with advancements in research areas that include the development of new Atomic Layer Deposition (ALD) precursors and methods, ALD reactor design, device fabrication using ALD and related chemical reaction-based methods, and electric vehicle battery and photonic device fabrication. Thus far, the project has yielded over 30 journal publications (accumulating over 150 citations) and 50 conference presentations; further information regarding some of our publications in Year 5 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 5

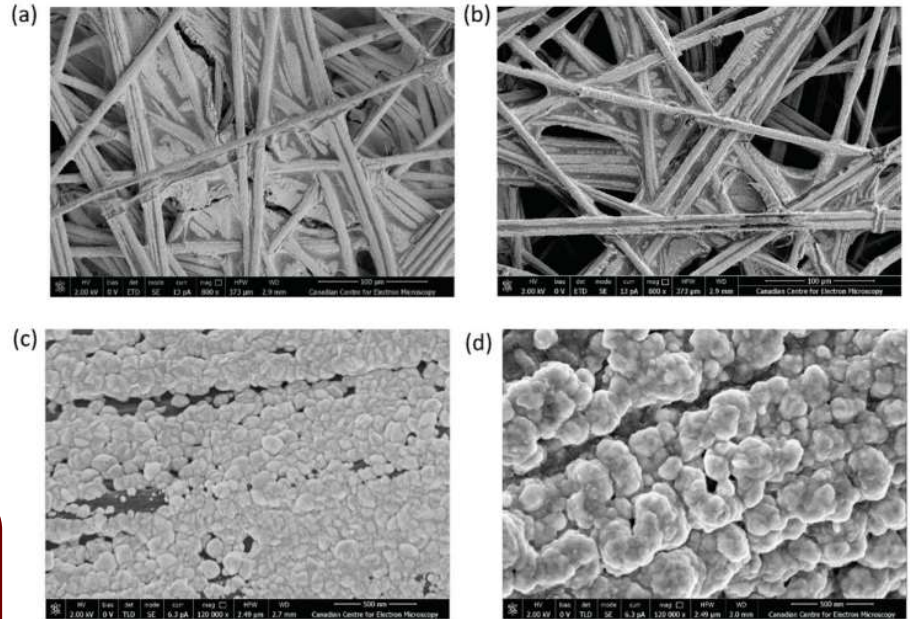
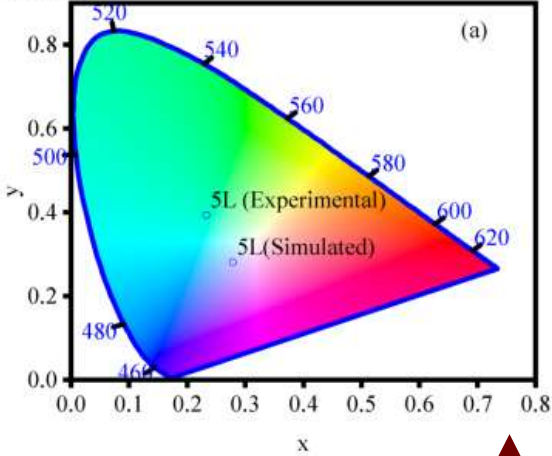
can be found on our website (link on page 4). New private sector and academic collaborations have also been added, four patent applications were submitted, and one patent was granted in Year 5.

Several graduate students and postdoctoral researchers presented their recent findings to fellow team members at the 2nd biennial ORF-RE Mini-Symposium which was held on April 27th, 2023. This event highlighted the interdisciplinary nature of the research, and was a great opportunity for team members to learn about all the different research taking place, and to discuss existing and potential collaborations. Team members also presented their research at a host of local and international conferences, including the 25th Photonics North Conference in Montreal, QC, Proceedings of the International Society for Optics and Photonics (SPIE) in San Francisco, CA, and the 2023 Canadian Chemistry Conference and Exhibition (CCCE) in Calgary, AB.

We welcomed new undergraduate and graduate students, as well as a new postdoctoral researcher, to our ORF team in Year 5. Several students also graduated and are now utilizing their unique set of experiences and skills to further their career goals. Some of these graduated PhD and MSc students have chosen to continue their exciting research on the ORF project as a postdoctoral researcher or research assistant. Further detail on team members that began or ended their work on the ORF project in Year 5 is provided on page 3.

GALLERY

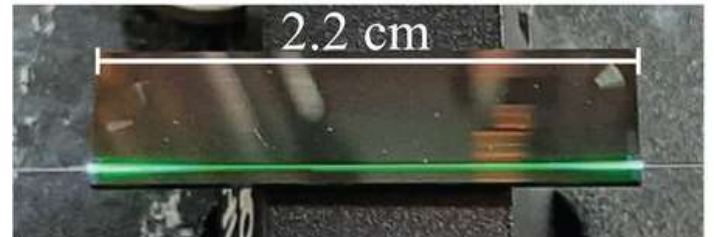
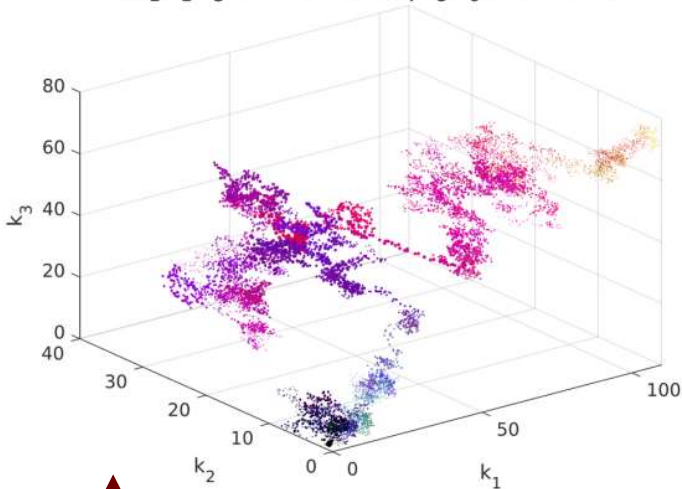
CIE 1931



Design and fabrication of color-generating nitride based thin-film optical filters for photovoltaic applications. P. Bhattacharyya, B. Ahammou, F. Azmi, R. Kleiman, P. Mascher, *J. Vac. Sci. Technol. A* **2023**, *41*, 033409.

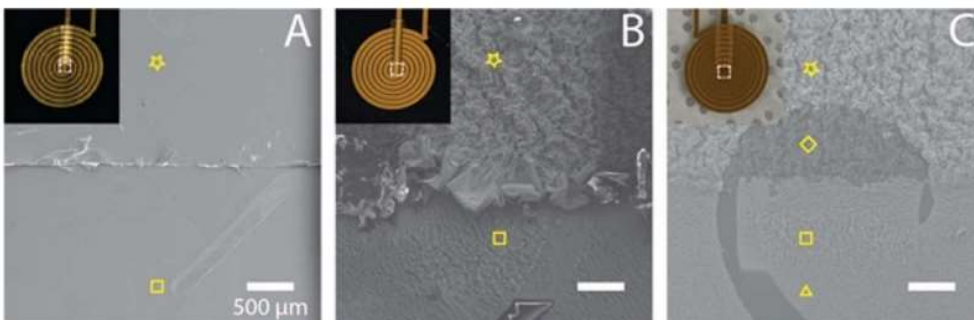
Atomic layer deposition ZnO-enhanced negative electrode for lithium-ion battery: Understanding of conversion/alloying reaction via ^7Li solid state NMR spectroscopy. Z. Sadighi, J. Price, J. Qu, D. J. H. Emslie, G. A. Botton, G. R. Goward, *J. Electrochem. Soc.* **2023**, *170*, 010512.

$\{k_1, k_2, k_3\}$ Space, $\text{RGB}(k_4, k_5, k_6)$, Size by $1/j$



Data-driven optimal closures for mean-cluster models: Beyond the classical pair approximation. A. Ahmadi, J. M. Foster, B. Protas, *Phys. Rev. E* **2022**, *106*, 025313.

Erbium-doped tellurium oxide distributed Bragg reflector lasers on silicon nitride chips. B. L. Segat Frare, D. B. Bonneville, H. M. Mbonde, P. Torab Ahmadi, B. Hashemi, H. C. Frankis, P. Mascher, J. D. B. Bradley, *Proc. SPIE 12424, Integrated Optics: Devices, Materials, and Technologies XXVII* **2023**, 124240E.



Stretchable thin film inductors for wireless sensing in wearable electronic devices. X. Ding, E. Shen, Y. Zhu, J. Moran-Mirabal, *Flex. Print. Electron.* **2022**, *7*, 035017.

STUDENTS AND POSTDOCS

New Members in Year 5

Yahya Albkuri obtained his PhD from the Baker group at the University of Ottawa. His postdoctoral research in the Emslie group is focused on the discovery of new ALD processes.

Fahmida Azmi obtained her BSc degree in Bangladesh. She began her PhD research in the Mascher group in 2018. Her research concerns the fabrication and characterization of rare earth-doped silicon-based thin film structures for photonic applications.

Niloofer Majidian obtained her BSc from Alzahra University and MSc from the University of Tehran. She joined the research group of Dr. Bradley in May 2022. Her PhD research is focused on optical sensors.

Yue Su is a PhD candidate working in the group of Dr. Moran-Mirabal. Her work involves the development of electrochemical sensors for bioanalytical applications.

Aiman Quadiri is a MSc candidate in the Goward group. Her research focuses on solid-state battery development.

Cameron Gurwell is an undergraduate researcher in the Goward group working on solid-state battery development.

Peisheng Xie is an undergraduate researcher in the Moran-Mirabal, and works on nanocellulose chemistry.

Lai Xu is an undergraduate researcher in the Xu group working on the development of advanced photonic devices.

Ali Atwi recently completed his MSc degree and will continue working in the Xu group as a research assistant. His work focuses on the development of mid-IR devices.

Majeda Al Hareri recently completed her PhD degree and will continue working in the Emslie groups as a PDF and project manager. Her work focuses on the discovery of new ALD processes.



ALD-deposited Al₂O₃ thin films of varied thicknesses.

Recently Graduated Members

Aya Kadri, MSc – Graduated in 2022 from the Emslie group, currently working in Hamilton, ON

Eduardo Gonzalez Martinez, PhD – Graduated in 2023 from the Moran-Mirabal group, will continue as PDF in Moran-Mirabal group

Dixon Sajan, BSc – Mitacs Globalink intern in the Mascher group from Cochin University of Science and Technology in India

Clayton Vrenjak, BSc – undergraduate researcher in the Xu group

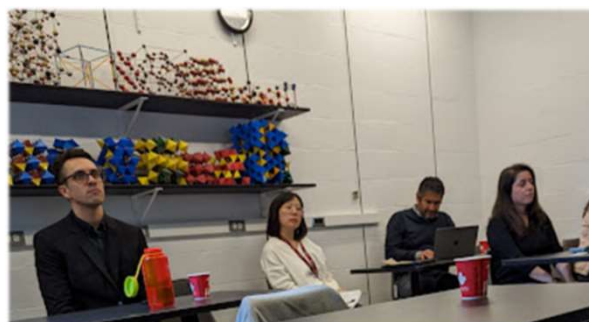
EVENTS & PUBLICATIONS

RECENT EVENTS

2nd ORF-RE Mini-Symposium

April 27th, 2023 – ABB 431

Thank you to all attendants and presenters!



ADDITIONAL PUBLICATIONS

C.-Q. Xu, et al. *Appl. Phys. B* **2023**, 129, 99.
<https://doi.org/10.1007/s00340-023-08045-4>

D. J. H. Emslie, et al. *Eur. J. Inorg. Chem.* **2023**,
26, e202200594.
<https://doi.org/10.1002/ejic.202200594>

J. D. B. Bradley, et al. *Laser & Photonics
Reviews* **2022**, 17, 22002216.
<https://doi.org/10.1002/lpor.202200216>

P. Mascher, et al. *J. Vac. Sci. Technol. B* **2022**,
50, 012202.
<https://doi.org/10.1116/6.0001352>

For a full list of ORF-RE
publications from Year 5,
check out our website!



CONTACT US

Prof. David Emslie
emslie@mcmaster.ca
Principal Investigator

Dr. Majeda Al Hareri
alhare@mcmaster.ca
Project Manager

<https://emsliegroup.mcmaster.ca/orf-re>

ACKNOWLEDGEMENTS

The ORF-RE ALD Network is administered by McMaster University, and is supported by an Ontario Research Fund, Research Excellence grant (ORF-RE; RE-09-051) from the Ministry of Research, Innovation and Science. We gratefully acknowledge the Province of Ontario for funding, the contributions of our six industry partners, support from the Faculty of Science and the Department of Chemistry & Chemical Biology at McMaster University, and our collaborators at the University of Alberta.