



QCAM

Quebec Centre for
Advanced Materials

Newsletter

December 2019

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QCAM Student symposium

This November 18th 2019 the new Quebec Center for Advanced Materials (QCAM) saw its first edition of the student symposium held at the Jean-Coutu Pavilion of Université de Montréal! The symposium was organized entirely by the QCAM student committee and saw a participation rate of over 210 participants, with over 80% of graduate students (MSc and PhD) from all 11 member institutions across Quebec. This bilingual event helped promote collaboration between QCAM members by increasing the visibil-



ity of member research groups, communicating research findings, and creating networking opportunities.

The program featured an impressive three plenary talks, 27 student oral presentations, and 120 student posters! The student talks and posters were divided into the six QCAM research themes: three fundamental themes (polymer science, self-assembly, and nanoscience) and three applied themes (energy, sustainability, and biomedical applications). The plenary lectures were presented by Prof. James Wuest (UdeM), Prof. Matthew Harrington (McGill), and Prof. Dongling Ma (INRS-EMT). The speakers shared their insights on controlling crystallization using the principle of modular construction, on the chemical and physical forces driving the self-assembly of in-vivo fabricated bio-fibers, and on the combination of plasmonic and superparamagnetic nanoparticles in either 2-D semiconductor catalysts or NIR quantum dots for applications in photocatalysis, bimodal imaging probes, and hyperthermia treatments.

The best student talk prizes were awarded to Steven Maurizio (Concordia), Gabrielle Mandl (Concordia), and Aya Sakaya (McGill), who presented their work on the sensitization of Terbium in core-shell upconverting nanoparticles for intrinsic time-tunable luminescence, the luminescence dynamics of Thulium in upconverting nanoparticles and their applications in NIR-responsive hydrogels, and the fluorescence mapping of redox activity in supported lipid bilayers.



The best student posters were awarded to Alexia Macina

(Concordia), Francisco Yarur Villanueva (Concordia), Victor Lotocki (McGill), and Shuaishuai Yuan (McGill), for their work on sustainable biodiesel through heterogeneous catalysis, on metal oxide-carbon dot nano hybrids for photocatalysis of organic reactions, on the design of miktoarm polymers based on dual stimuli-responsive soft nanoparticles for drug delivery, and on the delay of polaron formation in metal peroxides.



From left to right: Francisco Yarur Villanueva, Alexia Macina, Gabrielle Mandl, Steven Maurizio, Aya Sakaya, Victor Lotocki (missing: Shuaishuai Yuan).

Brilliant Matters' generous sponsorship is gratefully acknowledged.

 **Brilliant Matters**

QCAM annual symposium

Montreal (New Residence Hall), 7-8 May 2020

-Student workshop on scientific writing
-Outreach panel discussion
-International plenary speakers

CERMA Annual Conference - 2019 Edition

The 9th edition of the Colloquium of the Center for Advanced Materials Research (CERMA) was held on September 3rd at the Gene-H.-Kruger Pavilion in U. Laval, in collaboration with the CQMF/QCAM. As always, the symposium was organized by and for students, and this year's general theme was sustainable development.



The invited speakers were Céline Vaneekhaute, Pre at the Department of Chemical Engineering, U. Laval, and Mourad Ben Amor, at the Department of Civil Engineering and Building Engineering, U. Sherbrooke. The first presented her work on the valorisation of bio-waste in a circular economy perspective, while the second is specialized in life cycle analysis (LCA).

The conference innovated in different ways this year. First, in addition to the student oral presentations, those

who presented a poster were invited to a "pitch your poster" session where everyone had two minutes and a slide to convince the audience to visit their poster. Then, a tour of the equipment available at the Kruger was organized to introduce members to the possibilities at CERMA. This initiative has been highly appreciated and proved to be very relevant for a center that is spread over more than four sites throughout the city.

The latest innovation was the organization of a round table on the theme "Integrating sustainable development into research themes: between dream and reality". The panelists were Mourad Ben Amor, Elodie Boisselier (CERMA), Diego Mantovani (CERMA) and Denis Rodrigue (CERMA). Véronic Landry (CERMA) played the role of moderator. Although the theme was difficult for researchers who often work in the basic sciences, the roundtable brought out some interesting ideas that the Center could draw on for its development. Symposium website: <https://9emecolloquiecerma.wixsite.com/website>



Text and photos courtesy of Thierry Lefèvre (CERMA)

2019-2020 QCAM seminars



Song Jin

University of Wisconsin-
Madison, Madison,
Wisconsin, United States.

2019

December 4: INRS

December 5: McGill

December 6: Concordia



Jillian Buriak

University of Alberta,
Edmonton, Alberta, Canada

2019

December 9: INRS

December 10: Sherbrooke

December 11: U. Montréal



Thierry Brousse

University of Nantes, Nantes,
France

2020

February 18: UQAM

February 19: Sherbrooke

February 20: Concordia

February 21: McGill



Francesco Stellacci

EPFL, Lausanne,
Switzerland

2020

June 15: INRS

June 16: U. Montréal

June 17-19: UQTR

Not a dry subject: QCAM at “Pint of Science”

An energetic science communicator: an interview with Dominic Rochefort (UdeM).



Here’s a riddle for you: what do Usain Bolt and energy storage devices do side by side at the starting blocks? If you feel you’re off the mark, Dominic Rochefort will put you on the right track. Because this QCAM

member at Université de Montréal is not only an electrochemistry professor, but also a keen science communicator, always trying to find novel, effective ways to talk about this fascinating research topic. That’s why he walked up to the starting line during the 2019 *Pint of Science* festival, where he unpicked the inner workings of an energy device often overlooked by the public: the supercapacitor. And it’s at this point that the Jamaican superstar picks up the baton: his blistering sprint and supercaps have a lot in common. On the contrary, a marathon runner’s stamina better reflects how batteries work. Getting to grips with the difference between power and energy is the crucial point if one wants to make sense of the defining features distinguishing supercaps from batteries.

Can you tell us more about your experience at *Pint of Science*?

DR– This year, energy storage featured on the programme. The organisers invited me and I was quick off the blocks: I was going to talk about supercaps. It was a golden oppor-



tunity to present these energy devices to a broad audience more familiar with batteries. People are sitting at a table, beer in hand, and I was standing very, very close to them. This is what I found most interesting and stimulating.

How to put supercaps into context?

At the outset, I gave some practical examples to highlight the current practical limitations—nobody can charge a battery in two minutes, but one can do so with supercaps.

The crucial points of your talk?

Explaining the difference between power and energy. To do so, I drew a parallel with running. I think that this example provided the tools the public needed to figure out what makes supercaps so special among energy storage devices. After this, I presented several aspects of supercaps in quite considerable detail: their operating principles, the materials and electrolytes they are composed of. Also, I discussed the challenges we face if we want to increase the amount of energy stored in supercaps—something that is instrumental in a more widespread adoption of these devices.

What is at stake in science outreach?

Outreach has a twofold aim: to show people how science can have an impact on our everyday lives; to reach out to future students and spark their interest in chemistry research. Even the students currently enrolled at our department do not fully appreciate the role of chemistry in energy storage.

QCAM (post)doc: what next?



Eva Hemmer (assistant professor, University of Ottawa) received her PhD in materials science from Saarland University (Germany), focusing on the synthesis of lanthanide alkoxides and their decomposition to lanthanide-containing nanomaterials. This experience was deep-

ened when she worked as a postdoc on lanthanide-based nanoparticles for near-infrared bioimaging with Prof. K. Soga at the Tokyo University of Science. In 2013, she was awarded a Feodor Lynen Postdoctoral Fellowship from the Humboldt Foundation to work in the groups of Profs. F. Vetrone (QCAM member) and F. Légaré at INRS-EMT to develop lanthanide-based nanothermometers. In winter 2016, she joined the Department of Chemistry and Biomolecular Sciences in Ottawa to design and study next-generation lanthanide-based nanophosphors as multifunctional nanocarriers for biomedical and energy conversion applications as well as fundamental aspects of lanthanide-based functionalities in materials and molecules.



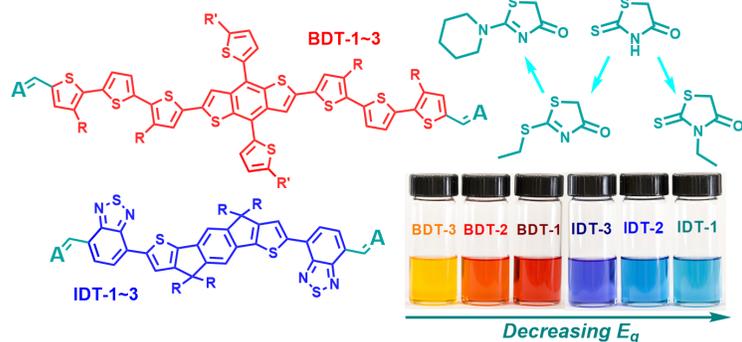
Phuong Nguyen-Tri (professor, UQTR, QCAM associated member) has recently joined the department of Chemistry, Biochemistry and Physics of UQTR as professor. He is also a regular member of the “Innovations Institute in Ecomaterials, Ecoproducts and Ecoenergies Biomass Based” ([I2E3](#)). He first obtained a

DEA at Mulhouse École de chimie de Mulhouse (ENSCMul), then moving to the CNAM (Paris) for his PhD. Afterwards, he worked as a lecturer-researcher at CNAM for two years before relocating with his family to Canada in 2011. He then worked as a researcher at the ÉTS (with Prof. T. Vu Khanh) and later at the department of Chemistry of Université de Montréal (with Prof. Robert E. Prud’homme, QCAM member). His research interests are mostly focussed on polymer crystallisation and advanced materials for energy and environmental applications.

E-mail matteo.duca@umontreal.ca to submit your story!

Bulletin board

QCAM collaborative project results in a paper in *The Journal of Organic Chemistry* The facile synthesis of a series of rhodanine-based end groups and their use in A-D-A organic semiconductors is reported. The properties



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Bags of particles

Nathalie Tufenkji's group reports on the release of micro- and nanoparticles from commercial plastic teabags immersed in hot water.

Covered in the news worldwide, and top 5% Attention Score (Altmetric)

[Environ. Sci. Tech.](#)

Beaming brightly "Giant"

CdSe/CdS core/shell quantum dots irradiated with protons display enhanced photocurrent generation. A report by Shuhui Sun's and Federico Rosei's groups.

[Adv. Funct. Mater.](#)

Analytical leader

Jean-François Masson secures a spot in the list of the 100 most influential analytical chemists [The Analytical Scientist](#)

Hot-shot lanthanides

Nd^{3+} based nanothermometers exploit NIR photoluminescence to provide excellent temperature sensitivity. A paper by Fiorenzo Vetrone's team.

[Nanoscale](#)

Robosoft

Liquid crystal networks swing into action under an electrical stimulus, allowing Yue Zhao's team to design soft robots. Don't miss the clips in the Supporting Info!

[Adv. Mater.](#)

New members!

- Prof. Ingo Salzmann (regular, Concordia).
- Dr Julia Del Re (industrial, AIM Solder).
- Dr Bruno Gélinas (industrial, Avmor).
- Profs Mihaela Cibian and Phuong Nguyen-Tri (associate, UQTR).

of the resulting materials are studied by optical spectroscopy, electrochemistry, and theoretical calculations. The permutation of central and terminal units tunes the optoelectronic properties and photovoltaic device characteristics in a predictable way, aiding in the rational design of small molecule semiconducting materials. Among the different end groups, N-alkylrhodanine revealed the strongest electron-withdrawing character, resulting in the lowest band gap, the highest stability, and the best photovoltaic device performance. Our crystallographic analysis discovered a highly unusual 3D packing of the conjugated backbone, which is likely responsible for the remarkable photovoltaic performance of such materials.

2020 QCAM Course

Inscrivez-vous maintenant! - Register now!

www.cqmf-qcam.ca



For the 2020 winter semester, the course will be open for registration at Université de Montréal, Université Laval, McGill, Sherbrooke, UQTR, Concordia. The course is structured as follows:

Lectures : 60- to 90-minute videos, half in English, half in French. The assessment will be in the form of a written examination.

Group activity: project proposing a new material / class of materials / device tackling a specific challenge.

For more info: e-mail qcam.chemistry@mcgill.ca

QCAM travel grants



Fanny
Casteignau
(UdeS/UdeM →
Université de
Paris), 2 months.



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(McGill →
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Massachusetts),
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