



QCAM

Quebec Centre for
Advanced Materials

Newsletter

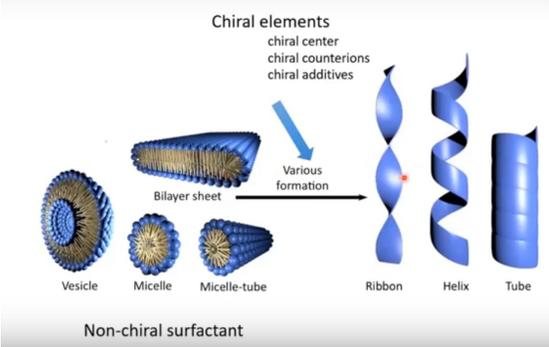
Winter 2021

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2020 annual symposium

On November 6th 2020, the Quebec center for advanced materials (QCAM) held its fourth annual meeting, the first one online. This event was made possible thanks to the effort of the organizing committee and the QCAM student committee, as well as the generous financial support of the Quebec funds for research on nature and technologies (FRQNT) and our sponsors. Despite the particular situation we were in during this year, the meeting gathered more than 200 attendees, stimulating many discussions among QCAM members and promoting the results of research groups coming from more than 10 universities

Induced chirality in molecular self-assemblies systems

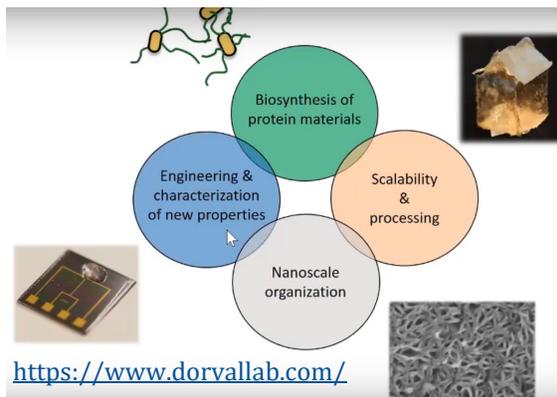


across Quebec.

The program included three plenary presentations and 36 student oral presentations.

Le plenary talks were presented by Dr Reiko Oda (IECB Bordeaux), Prof. Noémie-Manuelle Dorval Courchesne (McGill) and Dr Vincent Chevrier (3M Minnesota). Their presentations were about chiral molecule to chiral functional nano objects, functional materials produced by genetically modified bacteria and Nanostructured Si Alloys for Li-ion batteries.

The 36 student presentations were grouped according to the 6 QCAM research themes: polymer chemistry, self-assembled molecules and nanoscience (fundamental axes)



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but also developing functional materials for biomedical applications, energy applications and sustainability (applied axes). Among these presentations, 6 were given by our invited students Amélie Augé (UdeS), Jean-Claude Chartrand (UdeS), Ilknur Erylmaz (INRS), Hassan Fakhri (McGill), Yuan Fang (McGill) and Laurence Savignac (UQAM). For this year's meeting, 12 prizes were rewarded to the best student presentations, 6 first prizes were given to Pedro Donnarumma (Concordia), Dalia Jane Saldanha (McGill), Laurence Savignac (UQAM), Gabriella Tessitore (Concordia), Amin Valiei (McGill) and Yao-Yu Xiao (UdeS) and 6 second prizes were awarded to Hassan Fakhri (McGill), Mohamed Fatahine (INRS), Yuan Feng (McGill), Sagar Prabhudev (INRS), Gabrielle Raïche-Marcoux (ULaval) and Samira Ravanbakhsh (ULaval).

We would like to thank FRQNT and our sponsors [SFR](#) (Platinum), [Prima](#), [Molecular Vista](#), [SnowHouse](#) (Gold), [1^m-Material](#) and [RSC](#) (Bronze), whom made this event possible.

The plenary talks are available [online](#).

(article written by the QCAM student committee)

SAVE THE DATE - the 2021 annual meeting will take place on 27th and 28th May 2021 ([page 4](#))

Open windows to shut the door on the spread of COVID

A pressing issue marks the beginning of the 2020-2021 cycle of QCAM seminars

By Valerie Levée (science journalist)

Last spring, SARS-CoV-2 took the West by surprise when it left China to spread to Europe and North America. Protective measures represented the only roadblocks we could set up to halt its advance. But it looks like that airborne aerosols, potentially carrying the virus, slipped under our radars. SARS-CoV-2 could not spread through airborne transmission—or at least we believed so. In fact, pathogens that exclusively infect through airborne transmission (such as those causing tuberculosis and rubella) feature a much higher basic reproduction number (the famous R0) than SARS-CoV-2. Airborne transmission of SARS-CoV-2 was a matter of debate until WHO officially confirmed it. In the first of a series of QCAM seminars, professor Caroline Duchaine, Canada research chair on bioaerosols, presented this paradigm shift.

What are bioaerosols?

Airborne particle carrying dead or living organic matter (of biological origin)



Screenshot from the seminar by Caroline Duchaine

It is important to stress that no clear consensus exists on a unanimous definition of bioaerosols. Some refer to particles that are airborne over long distances and that can penetrate the lungs. Others include particles that can enter the nose and the throat but cannot reach the lungs. In the case of SARS-CoV-2, scientists have proposed a broad definition, including the entire range of inhalable particles from a few to 100 microns. An infected person can indeed produce this range of bioaerosols. On the other hand, the “aspiration hypothesis” suggests that SARS-CoV-2 do not need to reach the lungs to cause COVID-19. The virus will find ACE2 receptors in the nose, unlocking the door to the lungs. As a consequence, all bioaerosols carrying SARS-CoV-2, regardless of their size, could spread the disease.

We still do not know how far all of these bioaerosols travel. In principle, larger bioaerosols will rapidly fall to the ground less than 2 metres from the person producing

them—provided that the air is still. It is well-known that droplets show the same fate. But in actual facts, the air is never completely still. The most gentle currents of air, even the [heat given off by the human body](#), can make droplets remain suspended in the air. Indeed, some studies have managed to detect the presence of the virus in samples of [breath exhaled by patients](#) and in [aerosols](#). We can no longer exclude that SARS-CoV-2 is present in the air, nor its airborne transmission. A [modelling study](#), however, shows that ventilation can reduce the risks of infection.

There is no conclusive evidence on the actual viability of the virus in aerosols. Yet, we should err on the side of caution and implement these two other preventive measures: increasing the ventilation or opening the windows.



(Translated by Matteo Duca)

Further readings:

Sophie Zhang and Caroline Duchaine (2020). SARS-CoV-2 and Healthcare Worker Protection in Low-Risk Settings: A Review of Modes of Transmission and a Novel Airborne Model Involving Inhalable Particles. *Clinical Microbiology Reviews* <https://cmr.asm.org/content/34/1/e00184-20>

Morawska, L., & Milton, D. K. (2020). It is time to address airborne transmission of COVID-19. *Clin Infect Dis*, 6, ciaa939.

<https://academic.oup.com/cid/advance-article/doi/10.1093/cid/ciaa939/5867798>

Prather, K. A., Wang, C. C., & Schooley, R. T. (2020). Reducing transmission of SARS-CoV-2. *Science*.

[https://science.sciencemag.org/content/368/6498/1422#:~:text=Surgical%20mask%20material%20reduces%20the,droplets%20\(13%2C%2014\).](https://science.sciencemag.org/content/368/6498/1422#:~:text=Surgical%20mask%20material%20reduces%20the,droplets%20(13%2C%2014).)

Visit the [QCAM website](#) to consult the 2020-2021 seminar calendar. Selected seminars have also been made available on the same page.

Bulletin board (1)

Shedding light on speed thanks to upconverting nanoparticles made by John Capobianco's group. These luminescent probes containing Tm, Tb and Yb ions enable velocimetry without the need for calibration. A communication published in [Advanced Materials](#). To find out more, (re)read the first article by the Capobianco group on these nanoparticles ([Angewandte Chemie](#)). Applications of upconverting nanoparticles are also the top story in a science magazine (see below).

A memory like a sieve when it comes to porous materials? Fill the gaps in your knowledge of MOFs, HOFs, COFs with this survey at the cutting edge of the void. A [Nature Communication](#) review by James Wuest.

Crystal mech. A shake-up of cocrystallisation: a mechanochemical sleight-of-hand by Tomislav Friščić's group. They tweak the experimental setup to hack Ostwald's rule and trick adipic acid and nicotinamide into forming the metastable polymorph. Learn how to outsmart Ostwald in their [Chemical Science](#) paper. Shake to make, shake to break: Prof. Friščić has also collaborated on [mechano-enzymatic PET depolymerisation](#).

Graphics on graphene through photocycloaddition? Another example of molecular beauty, Roald Hoffman would remark. Federico Rosei and a team of international collaborators have just achieved this outstanding result. UV irradiation triggers an addition reaction involving a maleimide derivative and graphene. The researchers emphasise the spatial selectivity of reactive sites, which underpins the formation of a highly-ordered molecular adlayer. This structure bears a striking resemblance to a hexapetalous flower. A significant breakthrough paving the way for the design of opto- or nanoelectronic devices. [Nature Chemistry](#).

IN THE MEDIA

Time to drop membranes in alcohol fuel cells thanks to research by Mohamed Mohamedi's team. The INRS professor speaks to [Ici Radio-Canada](#) about it.

Fiorenzo Vetrone's nanoparticles for theranostic applications in the spotlight! Find out more in this article in [Québec Science](#).

In an interview with [le Devoir](#), Pierre Bénard emphasised that «Renewable energies are becoming more and more affordable, and [H₂] production technologies, such as water electrolysis, more effective”.

QCAM: at the forefront of the green transition

The comprehensive strategy outlined in the [Plan for a Green Economy](#) underscores the pivotal role played by research on advanced materials for energy applications. A broad overview of research carried out by QCAM groups: **Electrification of vehicles and critical and strategic minerals:** Recovering cathode metals and Si-graphite composites for anodes of Li-ion batteries; next-generation electrolytes for solid-state batteries, insight into structural changes of electrode materials by *operando* or *in situ* techniques. **Photovoltaic and photocatalysis:** synthesis of photoactive materials and study of their properties. Design of high-efficiency photovoltaic cells. **Hydrogen and renewable fuels:** (photo)electrolysis catalysts for hydrogen production, H₂ storage materials. Fuel cell membranes and electrodes. Power-to-X processes for energy conversion into bio- or electrofuels.

QCAM is a major player in research on materials and technologies indispensable for a successful green transition.

New members

- Prof. [Audrey Laventure](#) (associate, UdeM).

Update

- Mihaela Cibian is now a regular member
- Xiaolei Wang, who has joined the University of Alberta, is now an affiliate member

ACFAS' "La preuve par l'image" photo contest: jury prize awarded to [Jacopo Profili](#)

FRQNT "Relève étoile Louis-Berlinguet" prize

Two QCAM students have won it recently!

- [Laura Hernandez](#) (McGill, September 2020)
- [Mengyang Fan](#) (INRS, November 2020).

Bulletin board (2)

QCAM blog: coming soon!

Watch out: QCAM is going to launch its own blog! This outreach initiative will begin with a thematic series of four posts on research projects directly or indirectly related to COVID-19. Science journalist Valérie Levée, QCAM collaborator (see [page 2](#)), will write these texts.

We will soon share the first post on our [LinkedIn page](#) and on our [website](#). If you wish to suggest topics for the following posts, feel free to get in touch with Matteo Duca (matteo.duca@umontreal.ca).



IUPAC | CCCE
VIRTUAL
2021
August 13-20

Register for the virtual conference IUPAC-CCCE and attend one of the many sessions organised by QCAM members!

Québec Science's 2020 Discovery of the year:

several QCAM researchers feature in the research team that was awarded this prize. Their breakthrough: plasma-modified cellulose binders enabling aqueous Li-ion batteries.

PYRIDINE (research interface on structure and properties of polymer materials) obtains a CFI grant. The project is led by Jérôme Claverie.

QCAM ANNUAL SYMPOSIUM

Advanced Materials e-Annual Meeting

Save the date: we are delighted to announce that the 5th QCAM annual symposium will take place as a virtual event on **27th and 28th May 2021**. We are honoured to welcome the following outstanding lineup of invited speakers

- [Prashant Kamat](#), *University of Notre Dame, Indiana, USA*
- [Julia Greer](#), *Caltech, California, USA*
- [Ian Manners](#), *University of Victoria, British Columbia, Canada*
- [Xia Li](#), *Concordia University, Quebec, Canada*
- [Bart Kahr](#), *New York University, New York, USA*
- [Élodie Boisselier](#), *Laval University, Quebec, Canada*



IMPORTANT INFORMATION

Submit your abstract [here](#) (template [available](#)).

Oral presentations: 12 minutes (+3 for questions), in English or French.

Poster: a 3-minute flash talk.

[Mandatory registration.](#)

Abstract submission deadline: **9th May**
Registration deadline : **15th May**

Feel free to share this information with your industrial partners, the call for sponsorship is now open! Sponsorship levels: bronze (500 \$), gold (1000 \$), platinum (1500\$).

Looking forward to seeing you at the meeting!