

Symposium étudiant

INVITÉS ET COMMANDITAIRES



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“POLYMER NANOSTRUCTURES FOR PHOTONICS”

PAR

DAVIDE COMORETTO

DÉPARTEMENT DE CHIMIE ET DE CHIMIE INDUSTRIELLE
UNIVERSITÉ DE GÈNES
(UNIVERSITÀ DEGLI STUDI DI GENOVA)

“MATERIALS CHANGE. THE SCIENCE QUESTIONS DO NOT”

PAR

ARAM AMASSIAN

DÉPARTEMENT DE SCIENCE ET D'INGÉNIERIE DES MATÉRIAUX
UNIVERSITÉ D'ÉTAT DE CAROLINE DU NORD
(NC STATE UNIVERSITY)



Merci à nos commanditaires !

Faculté des arts et des sciences

Université 
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HORAIRE DU 22 OCTOBRE 2026



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8h30	Arrivée des personnes participantes
9h30	Mot de bienvenue et allocution de M. Jérôme Dupras (Scientifique en chef du Québec)
9h40	Conférence d'ouverture: Prof. Davide Comoretto
10h40	Pause
10h55	Présentations orales —Partie A
11h55	Dîner
13h00	Présentations orales —Partie B
14h00	Pause
14h15	Présentations orales —Partie C
15h15	Pause
15h30	Conférence de fermeture: Prof. Aram Amassian
16h30	Flash talk et cocktail
18h30	Remise de prix et Mot de remerciement

Salle A3502 - Campus MIL
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Prof. Davide Comoretto

POLYMER NANOSTRUCTURES FOR PHOTONICS

Polymers and their nanostructures represent a promising alternative to conventional metal oxides for photonic applications, owing to their ease of processing and their ability to form lightweight, free-standing, and flexible structures. After introducing the physical properties of polymer photonic crystals, including Distributed Bragg Reflectors (DBRs) and planar microcavities, together with the key requirements that polymer materials must satisfy for these applications,¹⁻² several examples of their use across a range of fields will be presented.

Polymer DBRs enable the development of label-free photonic sensors for monitoring environmental pollution in both air and water, as well as assessing food quality and degradation. These applications play a key role for environmental monitoring and in reducing food waste.³⁻⁵

Near InfraRed (NIR)-tuned multilayer photonic structures enable the reduction of solar heating by selectively NIR radiation while maintaining visible light transmission.⁶⁻⁷ Meanwhile, strongly scattering, low-loss white disordered membranes fabricated from recycled polymers enable sub-ambient radiative cooling.⁸ Both approaches provide passive temperature control, enhancing the energy efficiency and sustainability of buildings while reducing greenhouse gas emissions resulting from air-conditioning demand.

Moreover, thermoplastic elastomers can be used to fabricate mechanochromic photonic crystals, which can serve either as sensors for monitoring mechanical stress or as platforms for tuning the optical properties of materials and for the optical determination of the Poisson's ratio.⁹

Finally, polymer microcavities and metamaterials enable the engineering of fluorescence spectral redistribution, the Purcell effect, and strong light-matter coupling, phenomena that lie at the heart of modern photonics and emerging quantum technologies.¹⁰⁻¹³

Special emphasis will be placed on the use of recycled polymers and sulfur waste as sustainable building blocks for the fabrication of these nanostructures.^{4,14-15}

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- [3] L. Magnasco, et al., Polymer planar microcavities with CdSe-ZnS core-shell quantum dots for label-free vapor sensing, *Responsive Mater.* 2025, 3, e70017, <https://doi.org/10.1002/rpm2.70017>.
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- [6] A. Lanfranchi, et al., Engineering all-polymer planar photonic crystals as aegises against sunlight overheating, *Chem. Eng. Sci.* 2024, 283, 119377, <https://doi.org/10.1016/j.ces.2023.119377>.
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- [8] A. Lanfranchi, et al., Radiative Cooling by Green(er) Solvents-Upcycled Polyvinyl Chloride From Drug Blisters Waste, *Adv. Opt. Mater.* 2026, 14, e03720, <https://doi.org/10.1002/adom.202503720>.
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- [11] F. Bisio, et al., Micro- and nanopatterning of highly conductive PEDOT thin films, *Macromol. Rapid Commun.* 2026, in press, e70350, <https://doi.org/10.1002/marc.70350>.
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- [14] C. Tavella, et al., 2,5-Diisopropenylthiophene by Suzuki-Miyaura cross-coupling reaction and its exploitation in inverse vulcanization: a case study, *RSC Adv* 2022, 12, 8924, <https://doi.org/10.1039/D2RA00654E>.
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CONFÉRENCE DE FERMETURE



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Prof. Aram Amassian

Materials Change. The Science Questions Do Not.

A research career that is guided by durable questions can be coherent despite not being linear. Across my career, the materials have changed repeatedly, from inorganic oxides for photonics and molecular semiconductors for printed electronics, to colloidal quantum dots and metal-halide perovskites for solar energy. So have the places of research: Polytechnique Montréal, Cornell, KAUST, and NC State. Yet a small set of questions has remained remarkably stable: How does a material form? How does processing encode microstructure and properties? How do interfaces govern carrier behavior, polarons, excitons, and device function and stability?

Thin films have been the common sand box because their structure and interfaces play an essential role in all modern devices. Device measurements and in situ characterization have served as two complementary lenses. Devices provide an anchor for the science by testing whether our understanding matters, while in situ diagnostics reveal how materials form when they behave a certain way in a device and points to causal links between the two. I will trace how these lenses evolved from optical spectroscopy and X-ray scattering during vacuum deposition of inorganic and organic materials to multimodal measurements during solution processing organic and hybrid semiconductors, and ultimately to automated and AI-guided experimentation.

Many of the most consequential advances came from the broad understanding of thin film science from across several fields: growth concepts from vacuum deposition and epitaxy; liquid handling and laboratory automation from biotechnology and pharmaceutical research; singlet-oxygen chemistry from photosynthesis and photon-upconversion research; and life-cycle assessment adapted to high-throughput materials discovery. Through selected scientific stories and personal turning points, I will share lessons about building expertise that travels, choosing collaborators, and creating impact through the people, insights and shared tools that a community develops.

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PRÉSENTATIONS ÉTUDIANTES



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Partie A - 10h55

"A Neural Network-Based MC X-ray Approach for Quantitative Analysis of Multi-Element Bulk Samples"

Dawei Gao

"Chemometric Strategies for Data-Driven Self-Driving Laboratories"

**Mohamed Sami
Benzaimia**

"Inside the Battery: Operando NMR as a Tool to Study Redox Flow Electrolytes"

Gary Mathieu

"Computational Design of Novel Superionic Conductors: Insights into Energy Barriers and Ionic Conductivity"

Surya Timilsina

Partie B - 13h00

"Functionalized Bilayer Graphene: Hall and Raman Characterization"

Bahar Molavi

"Many-body dynamics in polaritonic systems"

David Tiede

"Physics-Constrained and Property-Guided Sequential Generation of Functional Materials"

Divya Sharma

"From Surface Imprints to Subsurface Plasticity: Crystallographic Orientation Effects in Non-Oriented Electrical Steel"

**Oluwasogo
Adegboyega**

Partie C - 14h15

"Versatile first row transition metal complexes with amidine-N-oxide ligands : Photophysics and photochemistry"

Arindam Saha

"Highly efficient and stable ruthenium terpyridine complexes for artificial photosynthesis of H₂"

**Ilyes
Oubaha**

"Observation de l'effet de parité sur des propriétés rédox de SAMs de ferrocene: une étude comparative de différents électrolytes"

**Indigo
Jerome**

"Gate-dependent Control of Aryldiazonium-Based Functionalization of Graphene Field-Effect"

Jade Cimmino

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PRÉSENTATIONS “FLASH”



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À partir de 16h30

Style concours “Ma thèse en 180 secondes” de l’UdeM

On condensed-matter techniques for detecting entanglement

**Claudia Victoria
Olivar Jimenez**

*Arrêtez de deviner vos paramètres : un pipeline libre
d'optimisation expérimentale pour tous les laboratoires*

Maxime Goulet

*Traquer l'invisible : micro- et nanoplastiques dans les eaux de
surface*

**Nelsie-Anne
Beatrix**

*Understanding the Thermal and Mechanical Characteristics of
PDMS for Enhanced 3D Printability and Print Fidelity*

Ramzi Zidani

*Breaking the doping paradigm: intrinsic phosphorescence in 3D
Covalent Organic Frameworks (COFs)*

Riddhi Bansal

Synthesis of Interlocked 2D Polymer Thin Films

Samuel Levesque

*From Artifact to Probe: Incoherent Photocarrier Mixing Reveals
Trap Dynamics in the 2D Photocurrent-Detected Coherent
Lineshape in a Perovskite Solar Cell*

**Simon Paiva-
Ortega**

*Synthesis and Structure-Property Relationships of Radical-
Bearing Porous Organic Cages*

**Taraneh Kourank
Beheshti**

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