

## Séminaire

Le lundi 7 mars 2022, midi

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\*Le séminaire se déroulera en anglais.\*

## Seminar

Monday, March 7, 2022, noon

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# Passive radiative cooling of solar cells by low-cost and scalable materials

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**Abstract:** Daytime passive radiative cooling is an attractive concept to improve the energy budget of buildings and photovoltaic systems. The key idea is the adoption of materials that strongly emit thermal radiation in the atmosphere transparency window (wavelength between 8 and 13  $\mu\text{m}$ ) as cooling layers. Significant progress in the field of metamaterials has enabled the realization of dielectric photonic structures able to achieve radiative cooling in daytime. However, their scalability to large-scale manufacturing seems to be out of reach. Here, I will present our study aimed at exploring the possible development of efficient, low-cost, and scalable radiative coolers based on cement oxides and hydrates, for application in rooftop photovoltaics. Electromagnetic and detailed-balance simulations suggest that the cooling performance of these materials can match state-of-the-art metamaterials reported in literature.

**Bio:** Matteo Cagnoni received his bachelor's degree in Computer Science and Electronic Engineering from University of Perugia, Italy, in 2012, his master's degree in Nanotechnologies for ICTs from Polytechnic University of Turin, Italy, in 2014, and his doctoral degree in Physics from RWTH Aachen University, Germany, in 2019. He developed his master's thesis at Tohoku University, Japan, where he investigated and optimized chemical-physical properties of perovskites for solar cells. His doctoral research focused on chalcogenides for phase-change memories and thermoelectric energy conversion, with emphasis on experimental characterization and theoretical modeling of the interplay between chemical bonding, band structure, charge/thermal transport, and optical properties, aimed at tailoring material properties for optimal use in functional devices. From 2019 to 2021, he worked for Intel Corporation's subsidiary IMS Nanofabrication GmbH, Austria, as physical modeling and simulation engineer and patent analyst, where he acquired expertise on finite element methods and design of electromagnetic components for charged-particle optics. In July 2021, Matteo Cagnoni joined the Department of Electronics and Telecommunications of Polytechnic University of Turin, Italy, as a postdoctoral research fellow. His current research interests include design and application of solid-state materials and structures for radiative cooling, thermoelectric energy conversion and intermediate-band solar cells.



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Le financement pour TOP-SET est fourni par le Conseil de recherches en sciences naturelles et génie. TOP-SET is funded by the Natural Sciences and Engineering Research Council of Canada.



Le financement pour ce séminaire est fourni par l'Université d'Ottawa. This seminar is funded by the University of Ottawa.