

#ICMolTalks

Prof. Ana Flavia Nogueira**University of Campinas (UNICAMP)
and Center for Innovation on New
Energies (CINE), São Paulo, Brazil**October 17th - 12:00h

📍 Assembly Hall - ICMol

**Abstract****Challenges with metal halide perovskites solar cells:
what we have learned so far using in situ and operando
experiments**

Ana Flavia Nogueira

University of Campinas (UNICAMP) and Center for Innovation on New Energies (CINE), São Paulo, Brazil

Although perovskite solar cells have recently surpassed power conversion efficiencies of 26%, several critical challenges remain. These include achieving a more comprehensive understanding of their nanoscale properties, developing reproducible large-area films with high optoelectronic quality, and ensuring long-term operational stability under harsh outdoor conditions.

Our group has advanced this field through in situ and operando studies, employing synchrotron radiation when appropriate, to unravel the fundamental processes governing device fabrication and performance. These efforts involve the investigation of precursor solution chemistry, the formation and crystallization pathways of perovskite films, their degradation under ambient stressors, the role and impact of chemical additives, as well as the formation of multidimensional interfaces aimed at improving both device efficiency and stability.

In this presentation, we will summarize key results obtained from in situ experiments probing the formation of 2D perovskite materials with different organic cations and their stabilities. The dynamics of structure formation, their thermal stability, and their spatial distribution within the 3D framework were studied using advanced techniques at the Brazilian Synchrotron National Laboratory, Lawrence Berkeley National Laboratory, and other facilities. We will also present the first results obtained at the Carnaúba beamline—the nanoprobe station at Sirius, the Brazilian National Synchrotron Laboratory—tracking how temperature cycling influences lattice strain in perovskite grains under operando conditions.

Biography

Prof. Ana Flavia Nogueira received her B.Sc. in Chemistry from the University of São Paulo (1996), and her M.Sc. (1998) and Ph.D. (2001) in Chemistry from the University of Campinas (UNICAMP). She carried out postdoctoral research at Imperial College London (2001–2002) and was a visiting researcher at Stanford University (2017–2018). Currently, she is a Full Professor at the Institute of Chemistry, UNICAMP, and Director of the Center for Innovation in New Energies (CINE, www.cine.org.br). Her research focuses on the development of functional (nano)materials for solar energy conversion. She has extensive experience in emerging photovoltaics, including organic and perovskite solar cells, chalcogenide and perovskite quantum dots, and the generation of solar fuels through photoelectrocatalytic systems using water, biomass, and other low-value substrates. Prof. Nogueira has published over 200 peer-reviewed articles, seven book chapters, one book, and three patents. She received the ACS Award for Leadership in Academia in 2020, is a Fellow of the Royal Society of Chemistry, and a member of the Brazilian Academy of Sciences. She also serves as Associate Editor of *Journal of Materials Chemistry C*, *Materials Advances*, and *Materials Today Chemistry*.

ORCID: <https://orcid.org/0000-0002-0838-7962>