



Exploring the synthesis of hybrid perovskites under microfluidic conditions.

Duration : 6 months internship (starting early 2023)

Location : IPCMS, Strasbourg, France and *Synchrotron SOLEIL*, Paris-Saclay, France

Hybrid Organic-Inorganic Perovskites (HOIPs) have been the subject of increasing studies in the last decade, from both fundamental and applied perspectives. This interest is driven by the peculiar properties that they display in relation to light emission and absorption and the corresponding applications in light capture and conversion. With a general structure following the formula ABX_3 (A being an organic monovalent alkyl ammonium cation, B a divalent metal cation and X a halide anion) their electronic and stability properties can be tuned by changing the nature of the organic cation. In particular, the length of the organic chain in the alkyl ammonium cation can have drastic effects on the secondary structure of these materials, hence on their properties. Up to now, the synthesis of these hybrid materials is not well understood, preventing the control of the final products properties.

A research grant was attributed by the USIAS ([University of Strasbourg Institute for Advanced Studies](#)) to Benedikt Lassalle and Ovidiu Ersen in 2022, in order to study the synthesis of HOIPs, using a combined *in situ* microscopy and spectroscopy approach. The aim of this project is to observe intermediate structures on the way to HOIPs and understand their evolution towards the final structures, in order to optimize their properties. Our strategy consists in developing microfluidic systems that will allow observing the synthesis of HOIPs under *in situ* conditions using electron microscopy and X-ray spectroscopy.

The aim of this internship is to explore the synthetic conditions of HOIPs under microfluidic conditions. The nature of the solvents, their ratios, the concentration of starting components and the temperature will be optimized to tune the time required for the reaction to occur. The preparation of new phases will also be explored by modifying these parameters. The materials obtained will be characterized by electron microscopy (at IPCMS) as well as X-ray absorption spectroscopy (at SOLEIL).

We are looking for a highly motivated candidate with a background in solution chemistry and ideally some experience in the synthesis of nanomaterials. Demonstrated skills in synthetic chemistry are expected while experience in characterization techniques would be appreciated. The ability to work in a collaborative team with several partners in different locations is expected. Excellent communication skills (both written and oral) in English are required.

The internship will be hired by and located at the ICPMS (Surface and Interface team) in Strasbourg, with frequent sessions in SOLEIL to develop microfluidic devices and collect X-ray spectroscopic data.

Questions and applications should be sent to:

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IPCMS is a CNRS/UNISTRA joint [laboratory](#), dedicated to the physics and chemistry of materials, located on the Cronenbourg campus in Strasbourg.

SOLEIL is the French national [synchrotron facility](#), located on the Paris-Saclay campus. It is a multi-disciplinary instrument dedicated to the study of matter in all its forms.