



## Understanding the synthesis of hybrid perovskites under microfluidic conditions with *in situ* electron microscopy and X-ray spectroscopy.

**Duration** : 2-year position (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 TEM and XAS *in situ* 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 follows two steps : i) develop microfluidic tools that can be used to probe a chemical reaction under *in situ* conditions using both TEM and XAS (and potentially SAXS/WAXS as well) and ii) establish the reaction landscape for the synthesis of HOIPs by the Ligand Assisted Recipitation (LARP) method. The well-known  $MAPbI_3$  (MA=methylammonium) will be used to establish the method, while other lead-free systems will be studied in a second step.

We are looking for a highly motivated candidate with a PhD in experimental sciences (physics, chemistry, material sciences) and a strong interest in instrumental developments. A demonstrated experience in either electron microscopy, X-ray spectroscopy or microfluidic fabrication is required. Knowledge of (hybrid) perovskites synthesis would be highly appreciated, while experience in synthesis and material characterization is mandatory. 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 post-doctoral fellow 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 XAS and SAXS/WAXS 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.