

PhD proposal

Title : Chalcogenide and oxysulfide perovskites for optoelectronic and photovoltaic applications

PhD director: Thomas FIX, Chargé de recherche CNRS HDR;

Host laboratory: Laboratoire ICube

Hosting institution: University of Strasbourg

Collaborations : IPCMS (A. Dinia, J.L. Rehspringer), IMN (M. Caldes), Univ. Uppsala (J. Scragg), IREC (A. Rodriguez), UPC (E. Saucedo), MET (J. Ulbikas)

Expected start date: October 2023

Summary :

Inorganic thin film photovoltaic technologies are mainly based on CdTe, amorphous silicon or CIGS. Recently, Pb-based perovskite materials have emerged as a promising alternative but suffer from toxicity and stability. Perovskites are based on the ABX_3 formula. In halide perovskites, A is a monovalent organic or inorganic cation, B is an octahedrally coordinated divalent cation, and X is a monovalent halide such as Cl, Br, or I. Oxide perovskites also have the ABX_3 formula with A and B cations but X is an oxygen atom. However many oxides provide a high bandgap not compatible with the solar spectrum. In chalcogenide perovskites, X is sulfur or selenium. While chalcogenide perovskites are still largely unexplored, several studies suggest that chalcogenide or oxysulfide perovskites can provide interesting semiconducting properties and a lower bandgap than oxide perovskites.

The objective of this PhD is to explore chalcogenide and oxysulfide perovskites with low bandgap for photovoltaic and optoelectronic applications. First these materials will need to be synthesized in the form of films. Different techniques can be used such as pulsed laser deposition (PLD), sputtering, or solution processing. The films will be characterized for their structural, optical, electrical, surface and optoelectronic properties by different advanced techniques. The hosting laboratory is fully equipped with synthesis, characterization, semiconductor and solar cell device fabrication and measurement. A strong collaboration is in place with IPCMS for further structural analyses, and with IMN for advanced sulfuration.

Applicants: please apply with a motivation letter, a CV and your Bachelor and MSc grades. Only highly ranked students will be considered and a statement of your final MSc rank is mandatory.

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