

2022

Master thesis proposal

Hosting laboratory:

ICube, 23 rue du Loess BP 20 CR - 67037 Strasbourg Cedex 2 - France

MaCEPV team: Materials for electronic and photovoltaic devices

icube.unistra.fr

icube-macepv.unistra.fr

| |
|--|
| <p>Exploration of novel Cu-based oxides for photovoltaics</p> |
|--|

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. We propose an alternative way which is based on oxides that are stable, non-toxic, based on abundant materials and can be synthesized using numerous methods. The ideal bandgap of an active photovoltaic layer for the solar spectrum is about 1.3 eV. Only few oxides possess such a small bandgap, and consequently interesting and original research can be led in this field.

The objective of this internship is to explore novel oxides with low bandgap for photovoltaic 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, thermal oxidation or solution processing. The materials investigated can range from doped Cu₂O, already known as an absorber, to novel CuGaO₂ that could possess a bandgap compatible with photovoltaics and appropriate properties for the role of an active layer. They 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.

The most promising ones can be integrated into all oxide stacks that can be characterized and modelled.

This work is partially funded under the framework of the IdEx University of Strasbourg.

Supervisor: T. Fix

Email: tfix@unistra.fr

Tel.: +33 (0)388106334