Photo-électrodes de type p pour cellules solaires pérovskite

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Stage pouvant se poursuivre en thèse : Oui

Résumé :

Nickel oxide based photoelectrodes will be developed for use in hybrid perovskite solar cells. Different deposition methods for NiO will be explored including electrospray deposition and the thickness, doping and morphology will be optimized. The subject also includes the fabrication and characterization of perovskite solar cells containing the obtained photoelectrodes.

Sujet détaillé :

Solution processed metal halide perovskites such as prototypical ?MAPI? (methylammonium lead iodide) have attracted tremendous research interest within the past five years due to their outstanding optical and electronic properties. Initially driven by the solar energy field with power conversion efficiencies exceeding 22% in 2017, many other applications of this new class of materials have been demonstrated, such as light-emitting diodes, lasers, photodetectors and X-ray detectors. In solar cells, TiO2 is conventionally used as the n-type contact on a transparent conducting electrode (FTO), leading to a n-i-p cell configuration. The main drawbacks related to this configuration are i) the pronounced hysteresis effect observed between the I/V curves recorded in forward and backward direction of the applied bias, and ii) the low stability over time.

Here we will study the use of NiO as the charge-selective contact, which leads to a p-i-n configuration in solar cells. This approach is expected to greatly enhance the environmental stability and to strongly reduce hysteresis effects. The internship focuses on the optimisation of the deposition of NiO layers (both dense and mesoporous) on FTO-coated glass substrates, using different methods as well as the structural, morphological and electrical characterization. Furthermore, the most promising photoelectrodes will be integrated into perovskite solar cells and the I/V characteristics will be measured in the dark and under simulated solar light.

Compétences requises :

Chimie des matériaux