

2015/2016

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

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Partner laboratory, funding the Master thesis:

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<p>Encapsulants functionalized with photon conversion for Si and CIGS solar cells</p>
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A. Bibliographic topic:

Use of photon conversion systems in solar cells.

B. Experimental topic:

The efficiency of solar cells is limited by the so-called spectral mismatch between the solar spectrum and the solar cell. A possible way to reduce these losses is to convert ultraviolet photons into visible photons that can be converted into a photocurrent by the solar cell. This photon conversion process is called downshifting. Here we propose to implement the downshifting functionality into the encapsulant of solar cells. Carefully selected and synthesized coordination complexes enable the downshifting property. The spectral response of Si and CIGS modules is limited by the fact that commercial encapsulants contain materials that are absorbing in the ultraviolet to prevent the yellowing of the polymer. In the case of CIGS solar cells, the necessary CdS layer is also absorbing in the ultraviolet. All these lost photons can be recovered using the functionalised encapsulants.

The work will be to test different coordination complexes in different polymer materials and to integrate them into solar cells. The experimental conditions such as polymer thickness, complex concentration will need to be optimised. The encapsulants and the solar cells will be characterised using optical techniques (uv-visible transmission, photoluminescence, photoluminescence-excitation, quantum yield...) and electrical techniques (spectral response, IV under illumination...).

The thesis will start around 1 March 2016 and finish on 30 July 2016.

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