Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : Steveler | Given names : Emilie

Status (prof., assistant prof., …) : Associate professor

Laboratory : Icube laboratory | Website address : http://icube.unistra.fr/en/

Institution : INSA Strasbourg | Website address : http://www.insa-strasbourg.fr/

Scientific competence of the supervisor:

Material science, Semiconductor device physics, Thin film technology, Optical spectroscopy, Photovoltaics, Optoelectronics

Two major publications in the field proposed for the PhD :

1. Long-range energy transport in single supramolecular nanofibres at room temperature, Haedler et al., Nature 523,196–199 (2015).
2. Thiazole-based scaffolding for high performance solar cells, Bulut et al. J. Mater. Chem. C 2016, 4, 4296

Website address of the personal page : https://www.researchgate.net/profile/Emilie_Steveler/info

Supervisor's email : emilie.steveler@insa-strasbourg.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-7

Title : Exciton dynamics in ordered organic thin films for photovoltaic applications

Subject :

In photovoltaics (PV), organic semiconductors (OSC) have recently attracted much interest. Due to the excitonic nature of OSC, it is generally necessary to use a blend of electron donor (D) and electron acceptor (A) materials (in the form of interpenetrated networks of nanometric size) to minimize exciton recombination and achieve efficient photo-induced charge generation and power conversion efficiencies. The morphology of the D / A blend at the nanoscale is however difficult to control and represents an important challenge for organic PV technology. A possible way to overcome this bottleneck is to design materials (D and / or A) with larger exciton diffusion lengths, for which the constraints on the D / A blend morphology would be reduced. In this general context, the proposed PhD work aims at studying the exciton and charge carrier dynamics in new molecular OSC thin films. As the transport of excitons and charge carriers in molecular materials is controlled by intermolecular interactions and depends on the molecular ordering, we will focus on series of PV molecules that have been found to self-assemble into various cristalline and liquid cristalline phases. Our goals will be (1) to better understand the relationship between structural order and exciton diffusion and thereby achieve larger exciton diffusion lengths, and (2) to develop new PV devices whose structure and processing take advantage of the enhanced exciton diffusion.

Keywords :

Organic semiconductor, exciton dynamics, device physics, photovoltaics

Expected collaborations :

This work will be carried out within the framework of a consortium established for several years around new organic materials for photovoltaic applications in Strasbourg. This consortium is composed of the four following laboratories: ICube, IPCMS, ICS, and ICPEES. Part of the PhD work will also be done with international collaborators (University of Bayreuth, Germany).

Background required from the applicant :

The applicant should have basic knowledge in the fields of materials science, semiconductor device physics and optoelectronics. Additional skills in the field of organic electronics and photovoltaics would be appreciated.

Existence of a PDF file detailing the proposal ("yes" or "no") : yes

(see guidelines on the website www-csc.utt.fr)