# COESIHON - Caractérisation Optique / Électrique de Cellules Solaires Inorganiques / Hybrides / Organiques Nanostructurées

CONTACT
jerome.faure-vincent@cea.fr

EQUIPMENTS

## LABORATORIES: INAC, LITEN, NEEL

**PRINCIPAL INVESTIGATORS : J. Faure-Vincent** (Equipment supervisor), J.-P. Travers (project initiator).

To facilitate the validation of proofs of concept in the field of photovoltaics, COESIHON offers powerful tools for device fabrication and characterization to the Grenoble's community. These tools are gathered in a facility named "Hybrid-En" which is dedicated to the study of new concepts, materials and structures in the field of energy. This facility is opened to researchers, students and post-docs, and to industrial partners.

In the photovoltaic field, the LANEF researchers have a known expertise in the fabrication and characterization of new nano-materials (organic, inorganic or hybrid semiconductors). Organic materials are mainly used in bulk heterojunction and researchers focus on new polymers with a better bandgap tuning for their use in tandem solar cells. Researchers also work on hybrid organic/inorganic structures (perovskite, Grätzel, or extremely thin quantum-dot-sensitized-absorber solar cells). The third main field concerns the development of type-II heterojunction nanostructures (core-shell nanowires) and new materials based on $Cu_2ZnSn(S_xSe_{1-x})_4$ or $In_{1-x}Ga_xN$ alloys.

COESIHON is focused on the fabrication and characterization of devices. It comprises a set of three interconnected gloveboxes under Argon atmosphere (spin coater, balance, hot plate), a deposition setup (metal and organic organic sources), and a certified AAA-class sun simulator (I-V characteristics, efficiency, semiconductor analyzer). In addition, the Hybrid-En facility offers an Incident-Photon-to-electron Conversion Efficiency setup to investigate the quantum efficiency of the solar cells, and an ageing test chamber for the study of the thermal and photochemical stability of the materials and devices.

Clément Thomassé

*Fig. 1: Glovebox line at the Hybrid-En facility.*

## OUTCOMES

**Users:**

P. Reiss, L. Grenet, H. Mariette, F. Alam, D. Joly, M. Mendez, D. Aldakov, R. Demadrille, R. André.

**Publications:**

[1] Efficient eco-friendly inverted quantum dot sensitized solar cells, J. Mat. Chem. A 4, 827 (2016);

[2] Structure and dopant engineering in PEDOT thin films: practical tools for a dramatic conductivity enhancement, Chem. Mater. 28, 3462 (2016);

[3] Synthesis, optoelectronic properties and photovoltaic performances of wide band-gap copolymers based on dibenzosilole and quinoxaline units, rivals to P3HT, Polym. Chem. 7, 4160 (2016);

[4] Insulated Molecular Wires: sheathing semi-conducting polymers with organic nanotubes through heterogeneous nucleation, Adv. Elec. Mater. 6, 1600370 (2017);

[5] Carbazole-based twin molecules as hole-transporting materials in dye sensitized solar cells, Dyes and Pigments 151, 238 (2018);

[6] Increasing the efficiency of organic dye-sensitized solar cells over 10.3% using locally ordered inverse opal nanostructures in the photoelectrode, Adv. Func. Mater. 1706291 (2018);

[7] CuSCN nanowires as electrodes for p-type quantum dot sensitized solar cells: charge transfer dynamics and alumina passivation, J. Phys. Chem. C 122, 5161 (2018)

**Patents:**

«Colorants organiques et leur utilisation dans les cellules PV» (FR1654125, 2016);

«Organic photochromic dye and uses thereof for dye sensitized solar cells» (EP17305597, 2017)

**Collaborations:**

P. Fedorko, Univ. of Bratislava, Slovakia;

M. Schiavon, Univ. of Sao Joao del Rei, Brazil;

L. Xu, Jilin Univ., China.

**PhD:**

C. Aumaître, M. Bouchard, F. Caffy, M. Godfroy, M. Gueye (LANEF), R. Fillon, M. Suzon (LANEF).

**Post-doc :**

G. Raj.

**Leverage:**

ANR projects (MATISSE, SUPERSANSPLOMB, ODYCE, HARVESTERS, PERSIL); European project (ORZEL).