

Organic semiconductors and photovoltaics at the group Linear Conjugated Systems

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Our research covers three correlated axes: molecular engineering of conjugated systems, functionalized surfaces, and realization of organic electronic devices. The latter, aimed at the identification of promising organic semiconductors (OSCs), benefits of a twenty-years experience in the design of conjugated systems and provides guidelines for the "return-to-synthesis".

OSCs as materials for organic photovoltaics are specifically designed to control the energy gap (solar light-harvesting) as well as the absolute HOMO and LUMO positions (i.e. control of the open-circuit voltage, environmental stability). The materials are studied by electrochemical, spectroscopic, thermal and X-ray diffraction methods, then implemented in devices such as bilayer and bulk-heterojunction solar cells, characterized in terms of mobility, IPCE, and PV response under solar simulated irradiation.

Among the current hot-topics of the group are the control of the molecular dimensionality (from one- to three-dimensional OSCs, the latter conceived as materials with isotropic electronic and transport properties) and the study of molecules with internal charge transfer (ICT). OSCs with ICT not only possess an absorption that better match the solar spectrum, but are also stable and beneficial for the open-circuit voltage value.

The design and synthesis of OSCs for PV applications will remain one of our research axes:

- the impact of the dimensionality of OSCs on the performance of solar cells deserves further investigation;
- ICT will be finely tuned and the resulting OSC will be explored not only as donor but also as ambipolar materials or dyes for sensitized solar cells.

To this end, we are open to collaborate with groups active in advanced characterization of OSCs or in device's physics and technology.

Recent articles on PV by our group are: A. Cravino, S. Roquet, O. Alévêque, P. Leriche, P. Frère, J. Roncali, *Chem. Mater.* **2006**, *18*, 2584; S. Roquet, A. Cravino, P. Leriche, O. Alévêque, P. Frère, J. Roncali, *J. Am. Chem. Soc.* **2006**, *128*, 3459; A. Cravino, P. Leriche, O. Alévêque, S. Roquet, J. Roncali, *Adv. Mater.* **2007**, *18*, 3033. *For a review of 2- and 3-D OSCs:* J. Roncali, P. Leriche, A. Cravino, *Adv. Mater.* **2007**, *19*, 2045.