

Post-doc in Molecular Chemistry (M/F): Synthesis and Study of Near-Infrared Organic Dyes for the Elaboration of Transparent and Colorless Solar Cells

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Apply Application Deadline : 21 May 2024

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General information

Offer title : Post-doc in Molecular Chemistry (M/F): Synthesis and Study of Near-Infrared Organic Dyes for the Elaboration of Transparent and Colorless Solar Cells (H/F)

Reference : UMR6230-SIMPAS-002

Number of position : 1

Workplace : NANTES

Date of publication : 30 April 2024

Type of Contract : FTC Scientist

Contract Period : 12 months

Expected date of employment : 2 September 2024

Proportion of work : Full time

Remuneration : 2934€ monthly gross salary

Desired level of education : Niveau 8 - (Doctorat)

Experience required : 1 to 4 years

Section(s) CN : Molecular architectures: syntheses, mechanisms and properties

Missions

In view of the inevitable climate change, the production of energy from sustainable and renewable resources is a major challenge of the coming decades. A significant amount of energy is received by the planet via solar radiation, which constitutes an almost infinite natural resource. This radiation can be converted into electricity using photovoltaic devices. Currently, the majority of devices based on dye-sensitized solar cells (DSSCs) or organic photovoltaics mainly capture light in the visible range, while a non-negligible proportion of radiation is found in the near-infrared (NIR). This program is part of the breakthrough field of colorless, transparent photovoltaic cells. Efficient photovoltaic technology in the NIR would enable the development of colorless, transparent solar panels that could be integrated into the glazing of buildings, vehicles, greenhouses and autonomous portable devices [1]. For this application, DSSCs are among the most promising devices, as they are simple to implement while offering competitive electricity production over the long term [2]. In this context, the aim is to develop NIR-selective photosensitizers, which is precisely the subject of the present PhD offer.

The TRANSITION project, funded by the Pays de la Loire region, Nantes Metropole and the CNRS, capitalizes our group's expertise and recent results in the fields of NIR dyes and colorless DSSCs [3]. More concretely, it aims to design heterocyclic organic dyes that absorb intensely and specifically in the NIR region, for the development of transparent solar cells. The research is interdisciplinary and particularly challenging: the postdoctoral candidate will develop the synthesis and purification of innovative NIR organic dyes, unravel their photophysical and electrochemical properties, and integrate them in a new generation of transparent solar cells developed in our group at CEISAM, and in collaboration with the team of Dr. F. Sauvage in Amiens.

References:

[1] C. J. Traverse, R. Pandey, M. C. Barr, R. R. Lunt, *Nat. Energy*, 2017, 2, 849–860.

[2] (a) W. Naim, V. Novelli, I. Nikolinakos, N. Barbero, I. Dzeba, F. Grifoni, Y. Ren, T. Alnasser, A. Velardo, R. Borrelli, S. Haacke, S. M. Zakeeruddin, M. Graetzel, C. Barolo, F. Sauvage, *JACS Au*, 2021, 1, 409–426; (b) F. Grifoni, M. Bonomo, W. Naim, N. Barbero, T. Alnasser, I. Dzeba, M. Giordano, A. Tsaturyan, M. Urbani, T. Torres, C. Barolo, F. Sauvage, *Adv. Energy Mater.*, 2021, 11, 2101598.

[3] (a) T. Baron, W. Naim, I. Nikolinakos, B. Andrin, Y. Pellegrin, D. Jacquemin, S. Haacke, F. Sauvage and F. Odobel, *Angew. Chem. Int. Ed.*, 2022, 61, e202207459; (b) T. Baron; W. Naim; M. Kurucz; I. Nikolinakos; B. Andrin; Y. Pellegrin; D. Jacquemin; S. Haacke; F. Sauvage; F. Odobel, *J. Mater. Chem. A*, 2023, 11, 16767–16775.

Activities

Molecule synthesis and purification

Electrochemical and photophysical studies

Solar cell design and optimization

Bibliography

Writing of reports and articles

Skills

The candidate should hold a PhD in Chemistry, and have a strong background in organic synthesis, as well as in spectroscopic and electrochemical characterization techniques. Previous experiences in the fields of chromophores or organic electronics would be highly appreciated, but are not mandatory.

Work Context

The CEISAM lab federates research activities in the field of molecular chemistry in Nantes. Within the unit, the IMF team (Functional Materials Engineering) has all the equipment required for designing and characterizing molecules, as well as integrating them into solar devices. Nantes is a dynamic city with a cultural and gastronomic focus, and is a forerunner in terms of ecological transition, offering a quality of life that is unique in France.

Constraints and risks

Health and Safety constraints related to the handling of chemicals. Chemical experiments will be carried out in a fully equipped and functional laboratory.