EFFECTOR, a luminous European project to develop organic photovoltaics
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SUSTAINABLE DEVELOPMENT INTERNATIONAL INTERVIEWS

Roger Hiorns, researcher at the Institute of Analytical Sciences and Physical Chemistry for the Environment and Materials (IPREM – CNRS/Université de Pau et des Pays de l'Adour/IMT Mines Ales), has just obtained funding European Union of three million euros for its EFFECTOR project on organic photovoltaics. With his colleague Didier Bégué, Professor at the University of Pau, he discusses the perspectives opened up by this technology and the opportunities offered by the Horizon Europe program.

What are the main challenges facing the photovoltaic sector today?

Roger Hiorns: The main challenge for photovoltaics is undoubtedly efficiency. We have reached a ceiling for the most commonly used material today, silicon. The challenge is therefore to develop new technologies, or combinations of technologies, and to find the best compromise between cost, efficiency, durability and flexibility for a given application.
Currently, several types of solar technologies coexist, each with its advantages and disadvantages. Silicon-based photovoltaics are very efficient and stable over time, but this technology remains expensive and is neither flexible nor portable. Perovskites, of which we are starting to see the first commercial examples in China, also offer good yields combined with lower production costs. They still have to resolve the problems of toxicity and rapid degradation under the effect of humidity and heat.
More recently, organic photovoltaics have emerged. This very promising technology uses small, flexible and lightweight organic (carbon-based) molecules or polymers that can be applied to curved and wearable surfaces. Its production cost should be very low, thanks to the simplicity of the printing processes, but we still have room to improve the efficiency and stability of this less mature technology.

You recently obtained funding from the Horizon Europe program as coordinator for your EFFECTOR project in the field of organic photovoltaics. What is this research about?

Roger Hiorns: With the EFFECTOR project, we will mainly focus on the development of polyfullerenes as additives for organic photovoltaics. These are polymers known since the 2000s. They are composed of a chain of fullerenes, which molecules in the shape of a football composed of 60 carbon atoms. Recently, these polymers can be produced in an efficient and environmentally friendly manner. These materials prove very useful for stabilizing organic solar panels, even the most recent ones that use what we call “non-fullerene” molecules[1]. On one hand, polyfullerenes help protect the photovoltaic cell from oxidation, while increasing the range of light absorption. On the other hand, they strengthen it mechanically and make it more flexible. A classic cell can break after two or three bends; with the addition of the polymer, it does not move even after a thousand flexions. Industrially, this changes everything because photovoltaics becomes viable for everyday objects.

How will this European funding help you progress in your research?

Didier Bégué: The significant amount of European funding constitutes an obvious advantage, but in my opinion the main interest lies in the dimension that Europe brings to our project. This allows us to go beyond the laboratory, to bring together very different partners who each contribute their stone to the building.

Roger Hiorns: Generally, our work at IPREM revolves around TRL[2] 1 or 2, that is to say very fundamental research. This European project allows us to collaborate with industrial partners with varied skills. For example, we are working with Polar (Finland) for heart rate monitor prototypes; Cardlab for biometric cards; with Dracula Technologies (France) for the production of solar panels; with InnoCell (Denmark) for supercapacitors... These manufacturers are taking us up to TRL 7, that is to say up to a potentially marketable system. In other words, we go from one end of the chain to the other and would never have had this opportunity alone.

Didier Bégué: Working with our industrial partners is enriching for everyone. We help them to improve their product by pushing the boundaries of knowledge in terms of synthesis and formulation to develop evermore effective molecules. They allow us to concretely verify whether what we predict in the laboratory works. As a theorist, who is used to my "finished product" being a computer model, this is really exciting.

What advice would you give to researchers who wish to respond to European calls for projects?

Roger Hiorns: My first advice would be to contact European project engineers (IPEs)[3], because they change the heavy administrative burden into something much easier. I would like to take this opportunity to thank Sabrina Paillet in Pau and Clémentine Gleizal in Bordeaux for their support!
My second recommendation is not to underestimate the importance of discussions prior to submitting the application file. Meeting partners face-to-face changes the situation because it demonstrates the serious nature of your approach while allowing everyone to build a friendly and pleasant working relationship. We can compare the construction phase of the project, which lasted a year and a half, with the time needed for its writing: the 50 pages were written in three weeks, although this might be because I don't like writing!
My last piece of advice is to build a story that suits you. A European project offers more ways to express yourself. So let your creativity run wild!

Editor: CD
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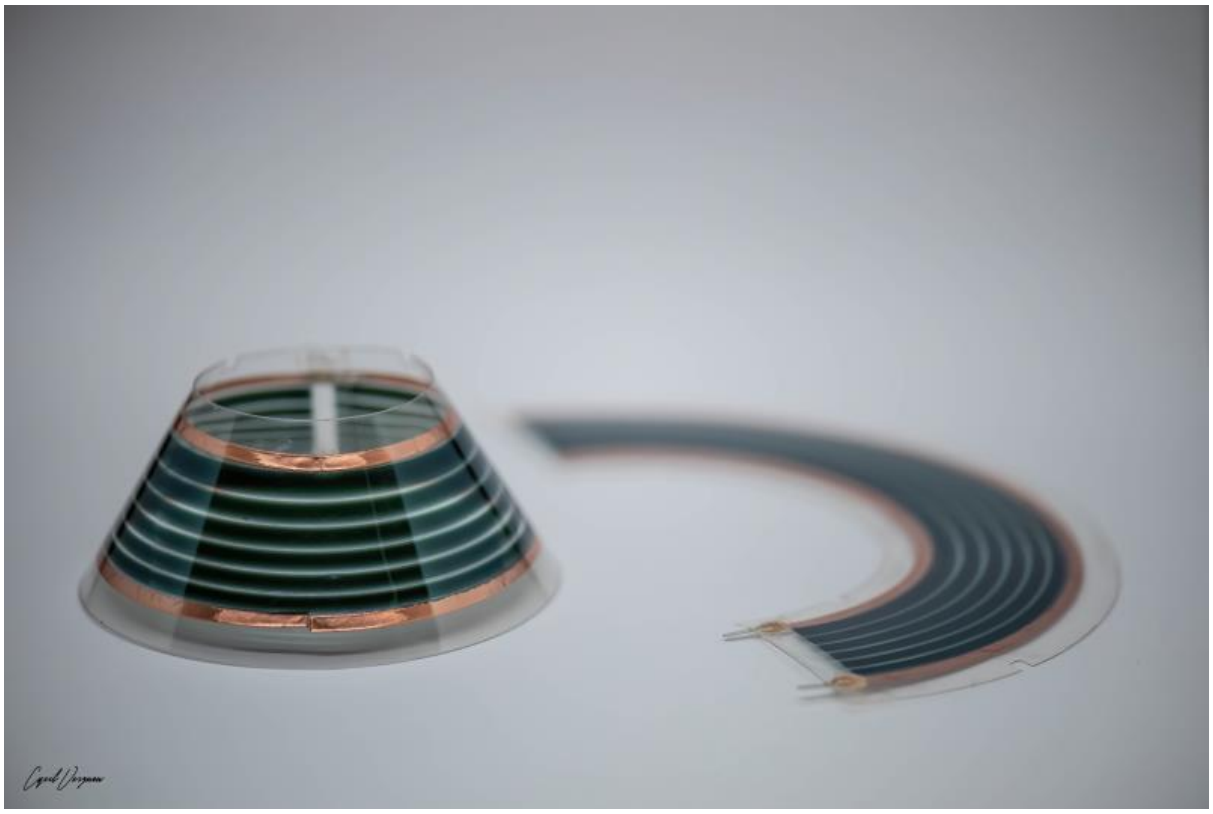
Roger Hiorns and Didier Bégué are looking for a project manager to manage the European EFFECTOR project. For more information, go to the CNRS Employment Portal.

[1] So-called "non-fullerenes", like Y6 or ITIC, are molecules capable of both absorbing light to create excited electronic states, and also capturing excited electrons to transfer them to the electrodes of organic solar panels. Polyfullerenes are added to stabilize them and help with charge transfer.

[2] The TRL (Technology Readiness Level) scale is a measurement system used to assess the maturity level of a technology.
[3] Local support offered by the CNRS to help set up European Projects.



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Contacts

Roger Hiorns
Researcher at the Institut des sciences analytiques et de physico-chimie pour l'environnement et les matériaux (IPREM, CNRS/Université de Pau et des Pays de l'Adour/IMT Mines Ales)
roger-clive.hiorns@cnrs.fr

Didier Bégué
Professor at the Institut des sciences analytiques et de physico-chimie pour l'environnement et les matériaux (IPREM, CNRS/Université de Pau et des Pays de l'Adour/IMT Mines Ales)
didier.begue@univ-pau.fr

Communication CNRS Chimie
inc.communication@cnrs.fr