***EXTRAORDINAIRE:* Addressing the most pressing question of solar energy conversion with organic solar cells**

2 Ph.D. Positions in Organic Photovoltaic Research

The University of Potsdam (Prof. Neher and Prof. Shoaee) and the University of Erlangen (Prof. Brabec) invite applications for 2 experimental Ph.D. positions in the field of photophysics and optoelectronics of non-fullerene acceptor solar cells. We are seeking two excellent graduates in Physics, Chemical Physics, or Materials Science. Each Ph.D. position is for three years, starting from 1st of September 2021, with the possibility of extension by a year.

The recent development of non-fullerene acceptors (NFAs) has been a game changer in the field. State of the art organic solar cells exhibit power conversion efficiencies of 18 % and above. Profiting from the strong excitonic absorption of these novel acceptors, NFA-based organic solar cells nowadays match their inorganic competitors in terms of current production. On the other hand, the excitonic nature of the primary photoexcited state requires an energy at the donor-acceptor interface to generate free charges, which in turn causes severe energy and photovoltage losses. This raises the question which fundamental processes limit the achievable photovoltage in state of the art OSCs and whether devices with even zero driving force may become feasible upon proper design of the NFA.

In the EXTRAORDINAIRE project, funded by the German Science Foundation, our groups at the University of Potsdam and the University of Erlangen will join forces together with the Andrienko-group at the Max-Planck Institute of Polymer Research, Mainz, to address this holy grail of organic photovoltaic research. To this end, we apply time resolved photoluminescence, femtosecond transient absorption spectroscopy, temperature and field dependent time delayed collection field and quasi-steady-state photoinduced absorption spectroscopy to polymer:NFA donor-acceptor systems of well-defined energetics and morphology. The unique combination of these transient and steady-state techniques, along with computational modelling, will provide detailed insight into the dynamics of excitons, interfacial excitations and free charges. Specially, by clarifying the role of the quantum characteristics in key photovoltaic processes, we aim at developing strategies to realize efficient organic solar cells with minimum energy offset.

The successful candidates will participate in the experimental investigations, and contribute to the development of models of charge generation and recombination in NFA based solar cells. This project will involve working together with other nationally- and internationally renowned groups in the field. The ideal candidate will have a BSC and MSc in Physics, physical chemistry, material science or equivalent. We especially welcome applications from female applicants.

Preferred skills and experience for both positions:

- Knowledge of condensed matter physics, photophysics, optoelectronic properties of semiconductors, and semiconductor device physics.
- Experience in spectroscopic techniques.
- Experience in the use of programs to perform and analyse experiments, such as LabVIEW, Python or Matlab™ is highly welcomed

Please send your application (including a short motivation letter, your CV and your publication list) via email to neher@uni-potsdam.de for Potsdam and to christoph.brabec@fau.de for Erlangen. The closing date is 30th of June 2021.

University of Potsdam:

The groups of Prof. Neher and Prof. Shoaee at the University of Potsdam are internationally recognized for their investigations of charge carrier dynamics in organic and hybrid optoelectronic devices. In EXTRAORDINAIRE, experimental work will focus on the details of the free charge generation and recombination in samples provided by the University of Erlangen. This will involve the application of various techniques pioneered by the Neher and the Shoaee group, including high resolution TDCF, BACE and PIA. These studies will be complemented by investigations of the bias- and temperature-dependent electroluminescence and photoluminescence properties to reveal the dominant recombination pathway and the role of the NFA singlet state on the V_{OC} loss.

For contact and further information:

Prof. Dr. Safa Shoaee (shoai@uni-potsdam.de).
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https://www.uni-potsdam.de/de/pwm/index
https://www.uni-potsdam.de/en/optoelectronics/index

University of Erlangen:

The group of Prof. Christoph Brabec at the Institute of Materials for Electronics and Energy Technology (i-MEET) at the University of Erlangen has developed highly reproducible preparation methods for photovoltaic blends and devices. In EXTRAORINAIRE, photovoltaic blends with NFA materials will be produced with defined donor-acceptor interface structure. Fingerprints from steady-state and dynamic optical spectroscopy (TRPL, Transient absorption spectroscopy down to femtoseconds resolution) can thus be directly related to microscopic structure and functionality. These relationships will be revealed using numerical modeling aided by machine learning methods.

For contact and further information:

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https://www.i-meet.ww.uni-erlangen.de/