



**Donnerstag, 21.05.2026, 15:30 Uhr**

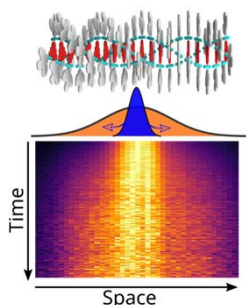
Ort: Reichenhainer Str. 90;  
Zentrales Hörsaal- und Seminargebäude, Raum C10.013

**Prof. Dr. Richard Hildner**

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## Transport processes in molecular assemblies: From supramolecular nanostructures to devices

To resolve and understand energy and charge transport in assemblies of organic molecules on a molecular scale, and to develop approaches to control and optimise such processes is a key challenge in engineering of organic devices. I will discuss how high-resolution optical spectroscopy and microscopy allow us to map these transport processes in space and time using two examples. First, I will show how we use well-defined single supramolecular nanostructures to visualise and optimise energy transport. By engineering the supramolecular architecture, we have achieved long-range transport over several micrometres at room temperature [1, 2], surpassing transport distances in conventional organic materials by more than two orders of magnitude. While this transport is along random directions, for device applications the introduction of directionality – or an energy funnel towards a specific direction – is important. We achieved such a funnel for energy by imprinting continuous energy gradients into nanofibers through controlled crystallization of conjugated polymers [3]. In the second example, our efforts in characterisation of the coupled ionic-electronic transport in organic electrochemical transistors will be discussed. Using hyperspectral imaging with high spatial resolution [4] we investigate morphological changes in the transistors' active organic layers upon swelling with an aqueous electrolyte. The intake and motion of ions in these swollen layers as well as the doping dynamics of the layer is monitored during transistor operation. This approach allows us to relate this charge carrier dynamics to the morphology of the layers and how microscopic properties translate into device scale behaviour.



[1] Wittmann, B.; Wenzel, F. A.; Wiesneth, S. et al. Enhancing Long-Range Energy Transport in Supramolecular Architectures by Tailoring Coherence Properties. *J. Am. Chem. Soc.* 2020, 142, 8323-8330.

[2] Carta, A.; Wittmann, B.; Kreger, K. et al. Spatial Correlations Drive Long-Range Transport and Trapping of Excitons in Single H Aggregates: Experiment and Theory. *J. Phys. Chem. Lett.* 2024, 15, 2697-2707.

[3] Staeter, S.; Wenzel, F. A.; Welz, H. et al. Directed Gradients in the Excited-State Energy Landscape of Poly(3-hexylthiophene) Nanofibers. *J. Am. Chem. Soc.* 2023, 145, 13780 - 13787.

[4] Ye, G.; Liu, J.; Qiu, X. et al. Controlling n-Type Molecular Doping via Regiochemistry and Polarity of Pendant Groups on Low Band Gap Donor-Acceptor Copolymers. *Macromolecules* 2021, 54, 3886-3896.



Alle Zuhörer sind ab 15:15 Uhr zum Kaffee vor dem Hörsaal eingeladen.