

BEAM Conference 2025

19–21 March 2025 | Halle (Saale), Germany

Mixed Conducting Polymers for Organic Electronics and Soft Robotics

Sabine Ludwigs 1*

*IPOC – Functional Polymers, Institute of Polymer Chemistry (IPOC), University of
Stuttgart, Pfaffenwaldring 55, 70569 Stuttgart
sabine.ludwigs@ipoc.uni-stuttgart.de

My presentation will give an overview over our recent studies on design and characterization of polymeric mixed conductors for organic electronics and switchable devices for soft robotics applications.

Self-assembly and controlled crystallization in films is a major topic in this context and different techniques to manipulate the morphology will be highlighted. A further focus is put on electrochemistry as versatile tool to control the doping level of organic semiconductors and target different redox states for, e.g., conductivity tuning in electronic devices.¹ Both, in-situ as well as ex-situ electrochemical techniques are discussed and correlations to the morphology of the films after doping are established.²

Beyond electronic applications, electrochemical switching can be used to induce volume swelling and deswelling. The role of mixed ionic-electronic transport³ for switchable surfaces and soft actuators⁴ will be elucidated with various in-situ techniques.

1 D. Neusser et al. *High Conductivities of Disordered P3HT films by an Electrochemical Doping Strategy*, Chemistry of Materials 2020, 32, 6003.

2 Y. M. Gross et al. *From Isotropic to Anisotropic Conductivities in P(NDI2OD-T2) by (Electro-)Chemical Doping Strategies*, Chemistry of Materials 2019, 31, 3542

3 M. Wieland et al. *Humidity-Controlled Water Uptake and Conductivities in Ion and Electron Mixed Conducting Polythiophene Films*, ACS Applied Materials & Interfaces, 2020, 12, 6742.

4 C. Dingler et al. *From Understanding Mechanical Behavior to Curvature Prediction of Humidity-Triggered Bilayer Actuators*, Advanced Materials 2021, 33, 2007982.