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EMIM-DCA post-treatment of semi-conducting PEDOT:PSS polymer thin films to improve their thermoelectric properties

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In times of constantly increasing energy demand, climate change and scarcity of fossil resources the need for renewable energies and the reduction of energy dissipation is of immense importance. Therefore, thermoelectric materials are of great interest in terms of waste heat recovery and the use of solar thermal energy, as they enable the direct conversion of a temperature gradient into electrical power. In particular, thermoelectric polymers are attractive, because in contrast to inorganic materials they are low or non-toxic, lightweight, flexible and enable a low-cost solution based processability. An often used way to evaluate thermoelectric properties is the so-called power factor PF=S²⊠. This parameter depends on the Seebeck coefficient S and the electrical conductivity ⊠, which are affected by the electronic and morphological features of the polymer. We are investigating methods to improve S and ⊠. Post-treatment of fabricated PEDOT:PSS thin films with ionic liquids like EMIM-DCA influences the electronic as well as the morphological polymer properties. Thus, we are able to increase S and ⊠ simultaneously, leading to an improvement of the power factor. With measurements of parameters such as S, ⊠, absorbance, layer thickness and determination of the structure, the underlying morphology-function relationship is determined.

Primary author: OECHSLE, Anna-Lena (TU München, Physik-Department, LS Funktionelle Materialien)

Co-authors: HEGER, Julian (TU München, Physik-Department, LS Funktionelle Materialien); LI, Nian (TU München, Physik-Department, LS Funktionelle Materialien); YIN, Shanshan (TU München, Physik-Department, LS Funktionelle Materialien); Dr STADLER, Hartmut (Bruker); Dr BERNSTORFF, Sigrid (Elettra Sincrotrone Trieste S. C. p. A.); MÜLLER-BUSCHBAUM, Peter (TU München, Physik-Department, LS Funktionelle Materialien)

Presenter: OECHSLE, Anna-Lena (TU München, Physik-Department, LS Funktionelle Materialien)

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