Contribution ID: 24

Characterization of conducting polymer films for thermoelectric applications

Short description: Poly(3-hexylthiophen-2,5-diyl) (P3HT) is one of the most prominent semiconducting, conjugated polymers in the fields of organic electronics and photovoltaics. Besides its high electric conductivity, it shows thermoelectric properties when doped with metal chlorides or nanoparticles, for example gold (Au). Thin thermoelectric P3HT films are of utmost importance and interest for future industrial applications. Here, it is essential to investigate the influence of different future large-scale fabrication techniques on the film quality and structure and, hence, its thermoelectric performance.

In the first step of this project, multiple polymer films of different thicknesses will be prepared using different P3HT-variants and dopant concentrations. Here, spin casting, spray deposition and slot-die coating will be used. In the second step, these samples key structural parameters, e.g. film thickness, surface roughness and electric conductivity, will be analyzed using different experimental techniques including atomic force microscopy (AFM) and ellipsometry as well as grazing incidence small-angle X-ray scattering (GISAXS) and X-ray reflectrometry (XRR). In the last step, all the obtained experimental data should be analyzed using the existing routines and the DPDAK software kit.

Duration: 6 weeks (2 weeks: lab introduction + preparation of samples using spin casting, spray depositon and slot die coating; 2 weeks: multi-method characterization of the samples including AFM, ellipsometry, electric conductivity measurements and possibly GISAXS as well as XRR; 2 weeks: data analysis using DP-DAK)

Literature:

R. M. Kluge, N. Saxena, W. Chen, V. Körstgens, M. Schwartzkopf, Q. Zhong, S. V. Roth, and P. Müller-Buschbaum: "Doping Dependent In-Plane and Cross-Plane Thermoelectric Performance of Thin n-Type Polymer P(NDI2OD-T2) Films", Adv. Funct. Mater. 2003092 (2020)

Field

A3: Soft-matter sciences (application oriented)

DESY Place

Hamburg

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Special Qualifications:

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