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Printed organic thin films for photovoltaic applications –a morphology study

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The conversion of energy out of sunlight is an indisputably promising possibility to tackle the problem of the continuously growing energy demand. Thereby, organic photovoltaics (OPVs) have attracted considerable attention, due to their outstanding characteristics, such as potential low-cost fabrication, high throughput, light weight, flexibility and easy processability. Fabrication techniques for OPVs devices vary depending on the used materials and include spray casting, inkjet printing and roll-to-roll printing. Among these, the scalability of the printing processes makes them attractive for industrial application, since it is possible to deposit the donor:acceptor blend of the active layer out of one solution. In this study, the influence of different ratios of donor and acceptor are explored for thin film bulk heterojunction OPVs deposited by printing methods. In order to characterize these solar cells their current-voltage characteristics as well as their absorbance spectra are measured. Additionally, the inner morphology of the active layers is probed with advanced scattering techniques, such as grazing incidence small angle X-ray scattering (GISAXS) and grazing incidence wide angle X-ray scattering (GIWAXS), to correlate structural information with the obtained photoelectrical properties of the devices. This correlation is needed to further optimize the processing parameters to enhance power conversion efficiencies and the overall performance of organic solar cells.

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