

Seminar

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Influence of Alkyl Side Chain Length on the Structure and Morphology of Poly(3-alkylthiophene) Thin Films Cast at Low and Room Temperature

The influence of alkyl side chain length and cast temperature on the crystallite orientation of regioregular poly(3-alkylthiophene)s (RR-P3ATs) were studied using X-ray and transmission electron microscopy analyses. The detailed analysis shows that the reduction in cast temperature (below room temperature (RT)) is an elegant way to increase the edge-on oriented P3AT crystallites on the substrate. The orientation and sizes of the P3AT crystallites were further enhanced by reducing the concentration of the solution (1mg/14mL). The out-of-plane stacking of P3AT crystallites are increasing with the alkyl side chain length while casting at -30°C due to their increased solubility. On the contrary, the in-plane ordering of P3AT thin films get worse with increasing alkyl side chain length, due to the stimulation of torsion in the thiophene backbone caused by the augment in steric hindrance between the grafted alkyl side chains. Subsequently, it hinders the OFET performance as well as the luminescent intensity. The field effect mobility of -30°C cast poly(3-octylthiophene) (P3OT) is twofold lesser than the poly(3-pentylthiophene) even though the P3OT film is composed of bigger and more edge-on oriented crystallites because of the formation of highly interchain stacked edge-on oriented crystallites. It concludes that the highly interchain stacked edge-on oriented crystallites are necessary for the fast charge transport where the growth along the chain axis (lc) is restricted due to thiophene backbone entanglement and folding of high molecular weight P3AT crystalline domains as observed through a high resolution transmission electron microscopy.

Wednesday, May 9, 14h15

Hörsaal Makromolekulare Chemie, Stefan-Meier-Str. 31

Invited by: Prof. Günter Reiter

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