



Experiment title: Structure formation of p-n interfaces between F ₁₆ CuPc and CuPc for organic photovoltaic		Experiment number: CH 2829
Beamline: Id03	Date of experiment: from: 06-05-2009 to: 12-05-2009	Date of report: 18-09-2009
Shifts: 18	Local contact(s): Dr. Andrea Resta	<i>Received at ESRF:</i>
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Report:

As stated in the proposal, we have grown mixed organic thin films by coevaporation of two different molecules, which is currently a very hot topic, also with relevance for organic photovoltaics. We performed *in situ* real-time X-ray reflectivity and grazing incidence X-ray diffraction (GIXD) measurements during growth. After each growth, post growth scans were applied to measure a large range in q-space. Since the analysis of the data is still in progress, we present only some important findings in this report.

In Figure 1 the reflectivity data of a PEN-PFP coevaporation film (1:1 ratio) is shown. Since the lattice spacing of the first two Bragg reflection does not belong to pure PEN and PFP phases, this data suggests that PEN and PFP form a mixed crystal phase during film growth. Additionally, the pronounced Laue-oscillations show that the crystalline thin film is well ordered in the out-of-plane direction.

The another bragg peak at $q_z = 0.95 \text{ \AA}^{-1}$ indicates the co-existence of a second phase. The substrate temperatures dependence shows that the intensity of the Bragg-reflection belonging to this second phase is strongly influenced by the temperature during growth.

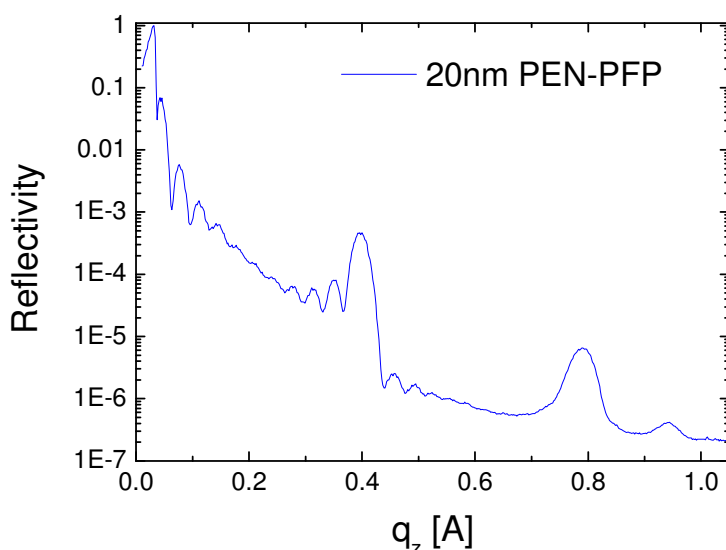


Figure 1: Out-of-plane post growth scan of a PFP-PEN coevaporation film.

The in-plane GIXD measurements of the films show some Bragg reflections, which do not correspond to those of the single film structures of PEN and PFP. Therefore, we conclude that the PEN-PFP coevaporated thin films can form a mixed crystal.

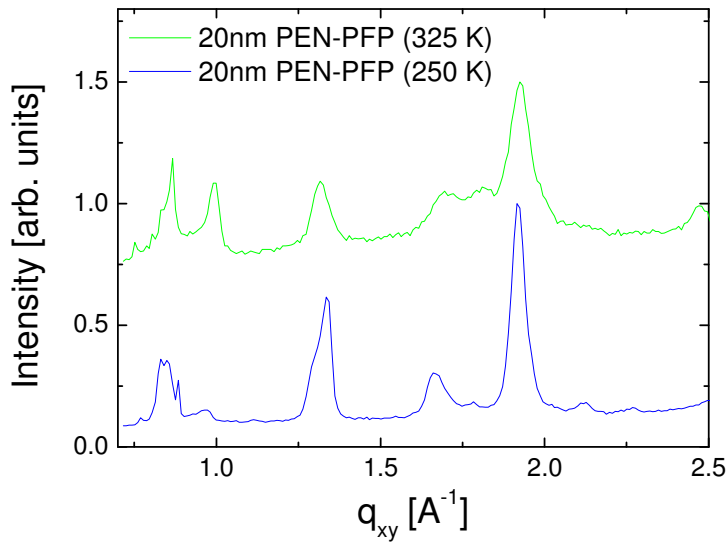


Figure 2: GIXD of PFP-PEN coevaporation films grown at two different temperatures (250 K and 325 K).

In addition real-time GIXD with a large MARCCD area detector was measured during growth. For a 1:1 molecular mixing ratio, the thin film crystal structure does not coincide with the structures of the neat films.

We wish to acknowledge the excellent collaboration with the local contact Andrea Resta which made this challenging experiment a success.