Reflectivity measurements on thin films of substituted PV-oligomers; synthesized via olefin-metathesis

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Poly-(*p*-phenylene vinylene) (PPV) has gained special attention since its employment as acting compounds in organic light emitting diodes (OLEDs) [1]. Disfavourable features are the insolubility and infusibility. Metathetic polycondensation of substituted 1,4-divinylbenzenes leads to soluble all-trans PV oligomers with valuable optical and material properties [2,3]. They can serve as model-compounds for the corresponding polymers and/or as active materials themselves.

For the application in OLEDs thin layers like films are desirable. In order to study the suitability of metathetically synthesized PV-oligomers for these devices, thin layers were prepared via spin-coating onto silicon wafers from solution (2.0 wt%; toluene/chloroform (1:1)). Reflectivity measurements were performed with the GIXD-setup [4] at the beamline A2 at HASYLAB. The intensity of the reflected beam was detected by a linear, gas-filled PSD. As layer material polydisperse mono- and disubstituted PV-oligomers were used (Fig. 1). Figure 2 shows exemplarily the reflectivity curves of two selected oligomeric films [5] with different thickness (d) and roughness (σ).

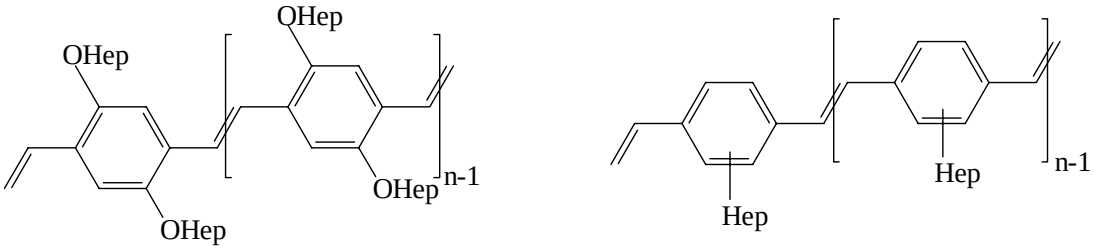

Figure 1: Samples investigated; 2,5-diheptyloxy and 2-monoheptyl substituted PV-oligomers

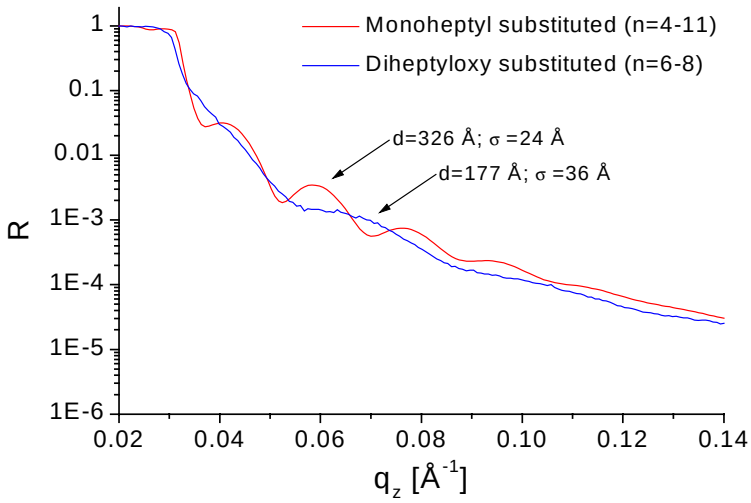

Figure 2: Reflectivity curves of two substituted OPV films

The curves were evaluated by means of the Parratt formalism [6] and roughnesses were determined as suggested by Névot and Croce [7]. As an example the measured reflectivity data and the calculated data of the monoheptyl substituted OPV film are presented in Fig. 3. From the fit one can derive the scattering length density profile as shown in Fig. 4.

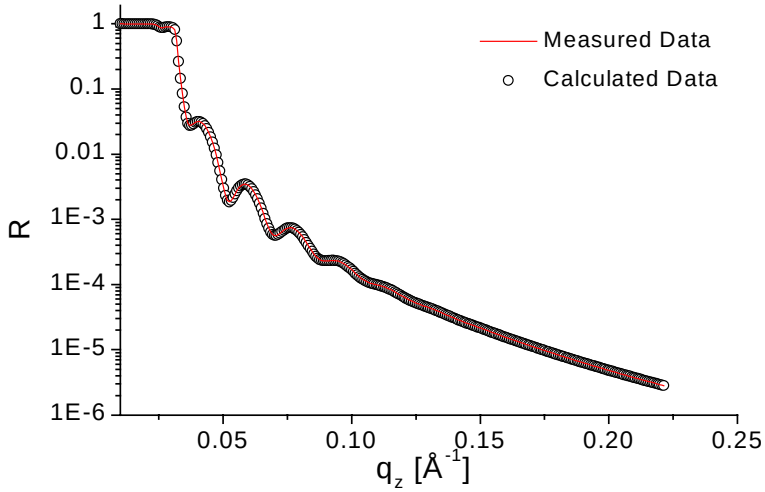

Figure 3: Measured and calculated reflectivity curve of the monoheptyl substituted OPV film

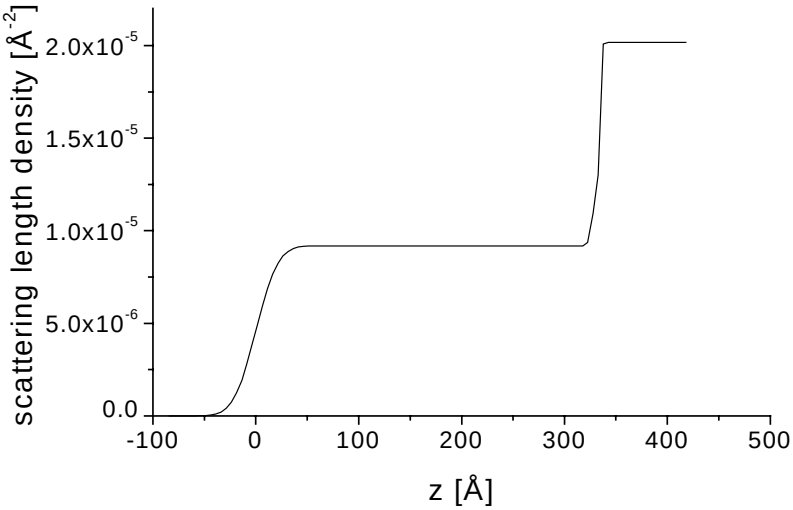

Figure 4: Scattering length density profile of the monoheptyl substituted OPV film

As a conclusion, reflectivity measurements are a valuable method to determine the material properties of thin PV-oligomer films on a nano scale.

References

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