ESRF	**Experiment title:** Templating effects of diindenoperylene and sexithiophene on the growth of C_{60} and reorganization of sexithiophene initiated by the depositionn of C_{60}	**Experiment number**: SI-2509
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Report:

Overview

In this experiment the growth of C_{60} buckminster fullerene layers was investigated using the small molecules diindenoperylene (DIP) and sexithiophene (6T) as template. For this purpose, the experiments were performed in a portable ultra-high vacuum chamber designed for the investigation of organic thin film growth *in situ* and in real-time. The growth rate and film thickness were measured using a quartz crystal micro balance which was calibrated via X-ray reflectivity measurements.
The bottom template layers were prepared under varyious growth conditions. Native Silicon oxide as well as indium tin oxide were used as substrate materials. Furthermore, the substrate temperature was changed (200 K, 270 K and 370 K). Different thicknesses for the bottom template layers were used to investigate a thickness dependence on the C_{60} layer.
During the allocated 18 shifts we successfully prepared 16 films in total and performed either real-time X-ray reflectivity (XRR) or real-time grazing incidence X-ray diffraction (GIXD) scans. For all the prepared samples, we did an exhaustive post-growth characterization including wide-range XRR and GIXD scans with corresponding diffuse and rocking scans. Furthermore, we used the provided 2D Pilatus detector to map the reciprocal space.

Quality of measurement and data

Due to the stable beam conditions all planned real-time measurements could be performed. For the real-time measurements we aimed for a good balance between time resolution, spatial resolution and covered q-range of the scans. The resulting time-resolution, depending on the scan type, is between one and two minutes. Compared to the total growth time of approximately two hours per film, we have obtained a detailed overview of the growth process.
In order to avoid beam-damage the measurement spots on the substrate were changed repeatedly during the real-time measurements to avoid a prolonged exposure on a single spot.

Status and progress of evaluation

So far, the data of the post-growth scans were examined qualitatively, background-corrected and converted to q-space. The data were compared to different known crystal structures of the used organic molecules and the in-plane Bragg reflections were identified (see Fig. 1). The data obtained at different substrate conditions were compared and also the datasets of the different materials were set into relation to each other. In the next step, the data will be analysed quantitatively via fitting. We will look into the corresponding real-time datasets and link thickness and time effects with the corresponding structural effects.

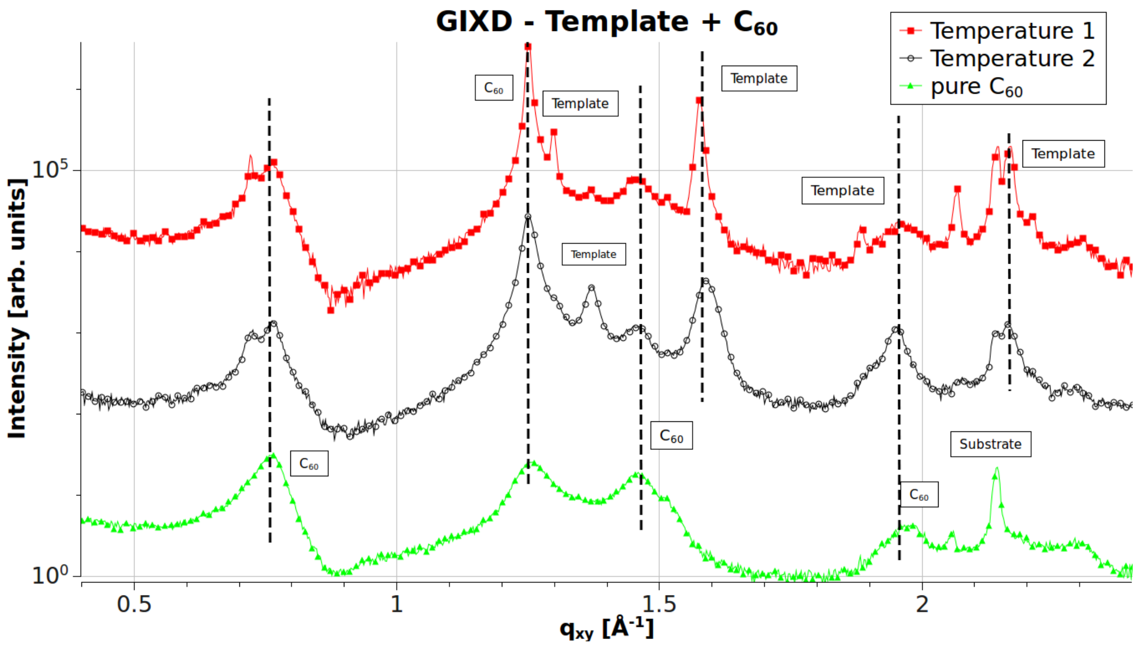

Fig. 1: GIXD measurement of templating layer and C_{60} at different temperatures. Some changes in the in-plane peaks were observed.

Preliminary results

As preliminary results we found a strong templating effect of 6T on C_{60} (compare Fig. 1). Surprisingly, the substrate temperature does not play a dominant role for the growth of the C_{60} but some detectable changes were seen.
An effect of reorganization in the 6T film during the deposition of C_{60} was not clearly observable.