	Experiment title: Influence of the organic molecule shape on the molecular surface dynamics	**Experiment number**: **SC-5267**
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Report:

Description of the experiment

In this experiment, we were growing thin films of PTCDI-C8, using the molecular beam deposition technique. During the film growth, we were measuring coherent x-ray surface diffraction to analyze it with the x-ray photon correlation spectroscopy (XPCS) technique. The film growth was performed in our own ultra-high vacuum deposition chamber that we brought with us. We installed the chamber on the diffractometer in the experimental hutch, and the Eiger 4M detector was placed seven meters downstream from the sample.

Preliminary results

We grew several PTCDI-C8 films with thicknesses of 15-20 nm at different substrate temperatures, i.e. low temperatures (T_{SUB} = -(50, 35) °C), room temperature (T_{SUB} = 35 °C), and high temperatures

(T_{SUB} = (70, 100, 150) °C). By choosing the temperature of the evaporation cell (around 290°C), we could regulate the deposition rate, which was 0.2 nm/min (normal rate), 0.25 nm/min (high rate) and 0.07 nm/min (low rate). During the growth, we were measuring XPCS scans with one second acquisition time and one second break, to avoid beam damage. After the growth, the films were heated up to ~200 °C until they were evaporated. The substrate was backed to ~500 °C for 30 minutes after each film to remove the remaining molecules.

Checking the two-time correlation function (TTC) on the bare Si substrate revealed that there was some drift or vibrations of the sample holder that might be caused by the heating of the substrate or the evaporation cell. An example of a good measurement is shown in figure 1. On the left hand side one can see the intensity oscillation of the correlation peaks taken from the diffuse scattering region. The opening and closing of the layers by the appearance (more diffuse scattering) and disappearance (less diffuse scattering) of the correlation peaks indicates layer-by-layer growth. On the right hand side the corresponding TTC is shown. While the film is growing layer-by-layer we see a constant movement, but as soon as the film gets rougher the system slows down.

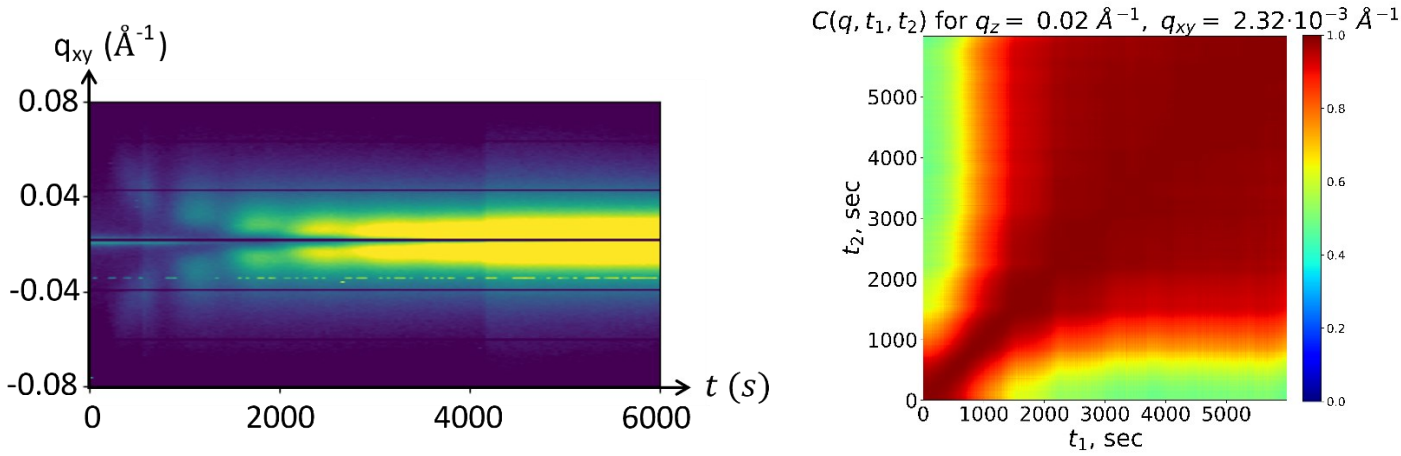

Figure 1: Development of an horizontal intensity cut during the growth of a PTCDI-C8 film at room temperature (left). The appearance and disappearance of correlation peaks is visible in the beginning, which indicates layer-by-layer growth. At a time of ~2000 seconds the film is gett appearance ing rough. Next to it is the corresponding two-time correlation function $C(q,t_1,t_2)$. Some constant movement appears during the opening and closing of the layers, afterwards the system slows down.