EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

ESRF

Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.

Once completed, the report should be submitted electronically to the User Office via the User Portal:
https://wwws.esrf.fr/misapps/SMISWebClient/protected/welcome.do

Deadlines for submission of Experimental Reports

Experimental reports must be submitted within the period of 3 months after the end of the experiment.

Experiment Report supporting a new proposal ("relevant report")

If you are submitting a proposal for a new project, or to continue a project for which you have previously been allocated beam time, you must submit a report on each of your previous measurement(s):

- even on those carried out close to the proposal submission deadline (it can be a *"preliminary report"),*
- even for experiments whose scientific area is different form the scientific area of the new proposal,
- carried out on CRG beamlines.

You must then register the report(s) as "relevant report(s)" in the new application form for beam time.

Deadlines for submitting a report supporting a new proposal

- 1st March Proposal Round - **5th March**
- 10th September Proposal Round - **13th September**

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

Reports on experiments relating to long term projects

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

Published papers

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report in English.
- include the experiment number to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.

ESRF	**Experiment title:** Growth kinetics of pentacene thin films investigated in-situ by XPCS in grazing-incidence geometry	**Experiment number**: **SC-4813**
Beamline: ID10	**Date of experiment**: from: 26 Jul 2018 to: 30 Jul 2018	**Date of report**: 20. Feb 2020
Shifts: 6	**Local contact(s)**: **Yuriy Chushkin, Federico Zontone**	*Received at ESRF:*

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Report:

We investigated the growth kinetics of pentacene (PEN) thin films in-situ and in real-time during growth with x-ray photon correlation spectroscopy (XPCS) at several growth temperatures.

The following X-ray scattering experiments were done at beamline ID10 of the ESRF with a photon energy of 8.1 keV under ambient conditions. The beam size was 10 µm in vertical and horizontal. GISAXS data was measured under an angle of incidence of 0.1° with an Eiger area detector.

Since the analysis of the data is still in progress, we present only some important findings in this report. As an example, in Fig.1 we show four GISAXS snapshots measured during PEN growth at low T. We find an in-plane correlation length correspnding to typical island sizes at this growth temperature. Fig. 1b shows thickness dependent line cuts demonstrating the evolution of the in-plane correlation features during growth.

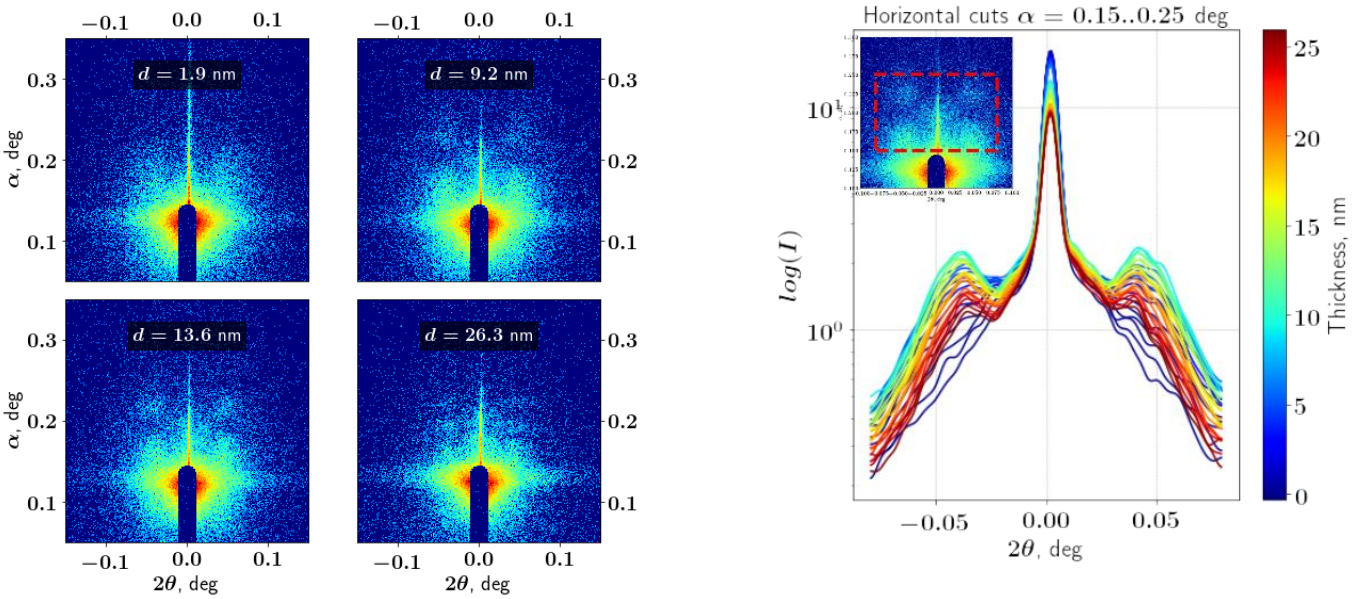

Fig. 1: Left: GISAXS snapshots measured during of PEN at low substrate temperature. Right: Evolution of the in-plane correlation length dependent on film thickness.

Fig. 2 shows exemplary time-time correlation functions of PEN growth and subsequent annealing. We find a strong angular dependence of the time-time correlation as well as a strong time dependence both during growth and during annealing suggesting complex surface reorganization dynamics.
We are currently simulating data corresponding to different growth models to account for the complex features in the time-time correlation functions and to account for the temperature difference observed for different growth temperatures (not shown).

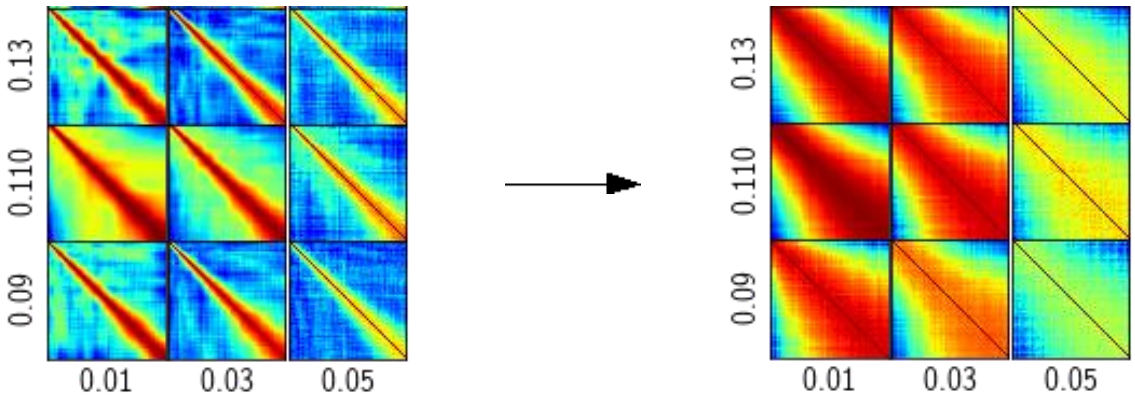

Fig 2: Time-time correlation functions of PEN thin films obtained during growth (left) and subsequent annealing (right). Each of the nine subplots show the time-time correlation dependent on the out-of-plane angle (z-axis) and in-plane angle (x-axis).

As stated in the proposal, we were able to measure XPCS data of pentacene during growth and during annealing. With these *in situ* real-time measurements, we expect to obtain a detailed understanding of the structural aspects of pentacene growth.

We wish to acknowledge the excellent collaboration with the beamline staff, which made this challenging experiment a success.