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

Reports supporting requests for additional beam time

Reports can be submitted independently of new proposals – it is necessary simply to indicate the number of the report(s) supporting a new proposal on the proposal form.

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.

Deadlines for submission of Experimental Reports

- 1st March for experiments carried out up until June of the previous year;
- 1st September for experiments carried out up until January of the same year.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal 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:** Simultaneous GIWAXS and in-situ electrical studies of nanofibers in thin film transistor	**Experiment number**: 28-01-1185
Beamline:	**Date of experiment**: from: 1/10/2016 to: 5/10/2016	**Date of report**:
Shifts:	**Local contact(s)**: Oier Bikondoa	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

***Oier Bikondoa & *Tom Hase** – *Univ. Warwick*

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Report:

Organic fiels effect transistors (OFETs) constitute a key component in organic electronics. We have studied the microstructural changes and durability of 5,5'-bis(naphth-2-yl)-2,2'-bithiophene (NaT2) in operando OFETs using grazing incidence X-ray diffraction.

The OFETs layout consisted of a highly n-doped Si carrier substrate as a back gate electrode with a thermally grown 200 nm thick SiO_2 layer as the gate dielectric. On top, interdigitated source and drain electrodes were fabricated using electron beam evaporation of titanium and gold followeb by photolithography and lift-off processes. NaT2 layers were deposited by vacuum sublimation.

Figure 1: view of the NaT2 sample mounted on a PCB board inside the environmental chamber.

These samples were mounted on PCB slots to allow electrical connections and the slots were introduced into a nylon/metal 3D-printed chamber. In operando electrical measurements were carried out by biasing the transistor with programmable voltage supplies. Two types of in operando measurements were performed: a) Transistor on/off measurements for different voltages + GIXRD measurements; b) Ageing tests (continous cycling of transistor) + GIXRD. A typical diffraction pattern is shown in Fig. 2

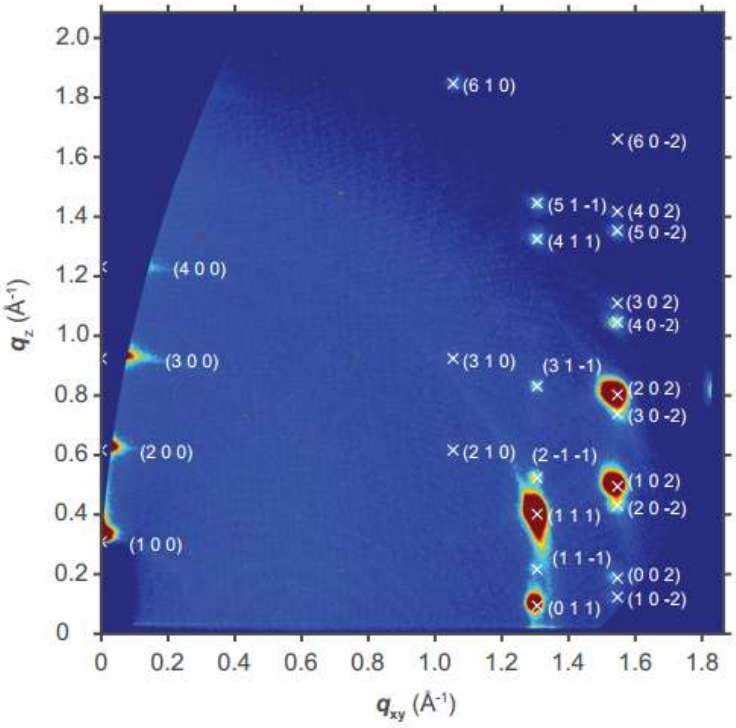

Figure 2: 2D GIXRD pattern of NaT2 on a running OFET.

The electrical performance and the lattice parameter changes were monitored during these procedures. We have found out that NaT2 maintains its bulk monoclinic structure in operating OFETs, and shows alignment out-of-plane but not in-plane. The NaT2 film is essentially a mosaic of sincle crystals.

A manuscript has already been submitted for publication in Organic Electronics and another one is in preparation.