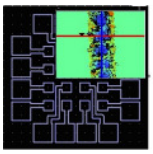
Research Cooperation Platform

- Research in dialogue -

The main task of the research cooperation platform is to perform collaborative research work in cooperation clusters, consisting of 4 to 7 PolyNet partners. Important objectives of this task are to focus on such issues and problems that demand the collected effort of several partners to be resolved and are commonly viewed to be important for the development of the field, and to promote present and future collaboration by regular exchange of staff.

The six research collaborations in operation during 2009 are continuations or revisions of the collaborations from 2008. In the following, an overview of the research activities will be given for each collaboration. Further information and contact details are available at www.noe-polynet.eu.

Contact Research Cooperation Platform: Isak ENGQUIST (isaen<at>itn.liu.se / Linköping University, Sweden)



Collaboration 1 – Laser ablation

The Laser ablation collaboration has set as a goal to integrate laser-ablative microstructuring into R2R printing technology. During 2008 it has been shown that functional conductive PEDOT:PSS patterns can be R2R produced by gravure printing followed by laser ablation. A test pattern with an inset showing the measured depth profile of one laser ablated line is shown in Figure 1. The scientific focus for 2009 is set to evaluate laser ablation as a possible process for patterning anode structures used in OLED/OPV applications.
For further information please contact Thomas Blaudeck, thomas.blaudeck<at>physik.tu-chemnitz.de

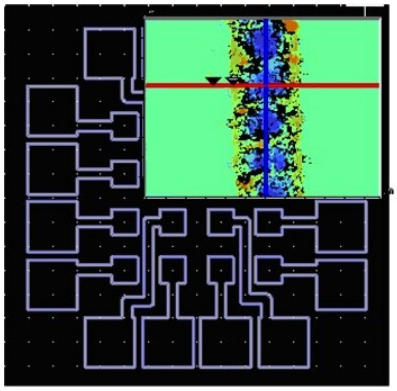


Figure 1. Laser ablation: Test pattern with inset showing depth profile of laser ablated line.

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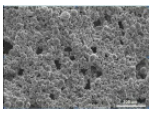

Collaboration 2 – Thin film batteries

The second collaboration aims to analyse production methods for thin film batteries to be able to propose efficient production methods, along with materials recommendations and integration schemes for final products. Anode and cathode inks for printed lithium-based batteries have been formulated and used in successful printing trials (Figure 2), showing promise for screen and gravure printed batteries.

For further information please contact Thomas Blaudeck, thomas.blaudeck<at>physik.tu-chemnitz.de

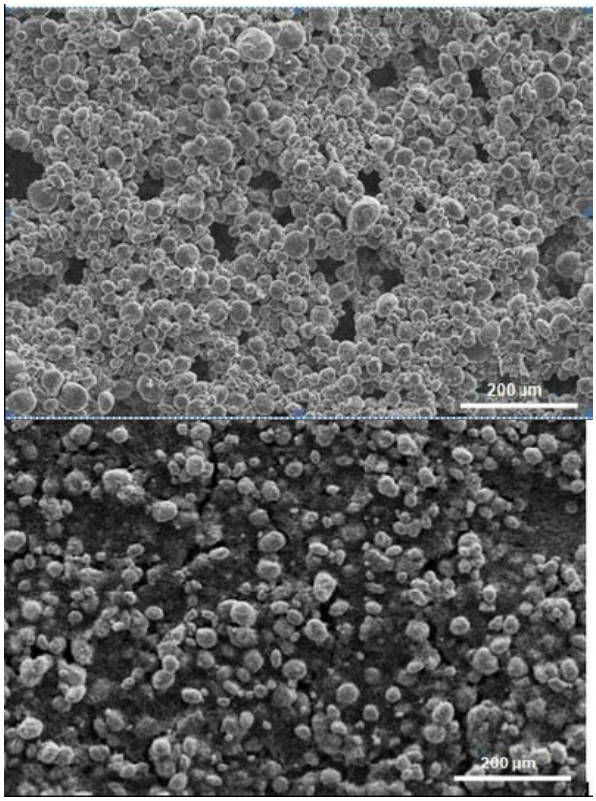

Figure 2. SEM images of screen printed graphite-based (left) and lithium-based (right) inks.

Collaboration 3 – Nanoimprint lithography

A technology platform consisting of six PolyNet partners has been set up to demonstrate the feasibility of R2R nanoimprinting for the fabrication of sub-µm OTFTs. During 2008, the material system has been defined and the feasibility of the process demonstrated from the front-end to the core process (Figure 3). During 2009, work continues towards the first OTFT test devices. To the best of our knowledge, this is the first technology platform for such high resolution processing in Organic Electronics in Europe.

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For further information please contact Herbert Gold, herbert.gold<at>joanneum.at

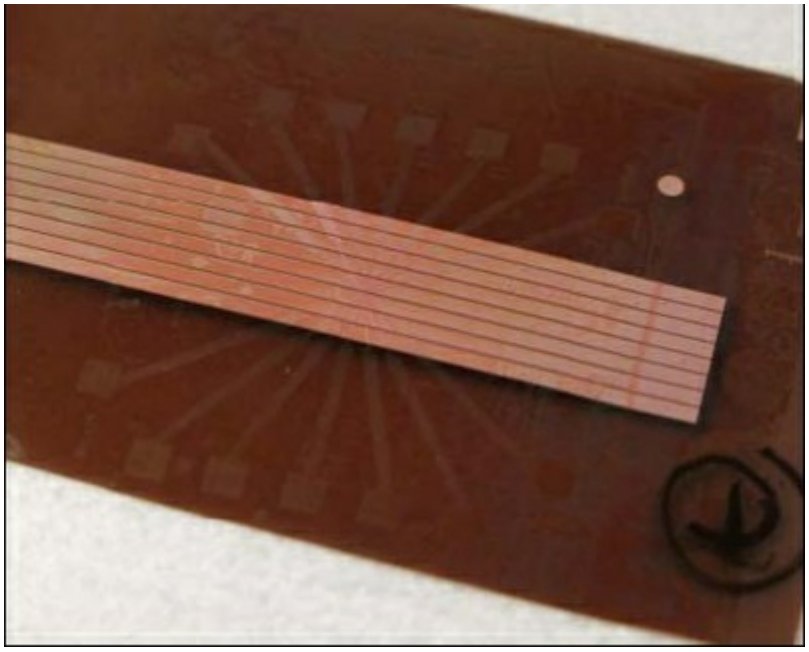
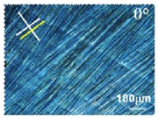


Figure 3. Flat bed embossed sample from the NIL collaboration.



Collaboration 4 – Multifunctional materials

In the fourth collaboration, focus is on materials with the potential to limit the number of steps in fabrication of organic electronic devices. Several new n- and p-type organic semiconductors have been synthesized and oriented, and crystalline semiconductor films have been deposited using unconventional thin film deposition methods. As an example, Figure 4 shows thin, oriented crystalline films obtained by zone-casting of the molecule DTT7 synthesized by an external partner. Chemical, structural and electrical characterization of materials and OTFTs has been performed, and continues in 2009.

For further information please contact Beata Luszczynska, beata.luszczynska<at>p.lodz.pl

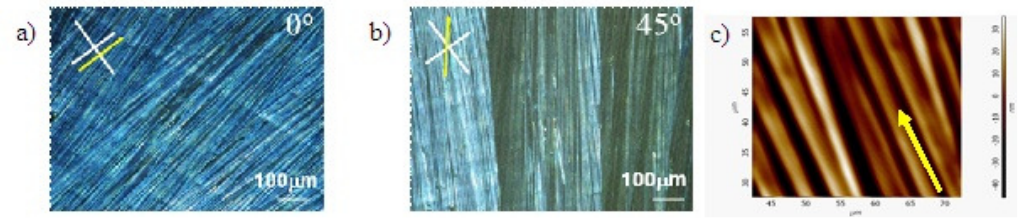


Figure 4. a,b) Polarized optical microscopy images of semiconductor molecule DTT7 on glass substrate; c) AFM images of DTT7 layers on Si/SiO_2. Yellow arrows: Casting direction.

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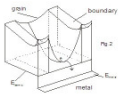


Collaboration 5 – Device modelling

The modelling collaboration has the goal to find physical analytical device models that can be inserted into commercial software to predict circuit performance. Focus is on OTFTs and Schottky diodes, and on predicting gate voltage stability. Characterization of PTAA components has been performed and work is ongoing on polycrystalline components (Figure 5).

For further information please contact William Eccleston, beccle<at>liv.ac.uk

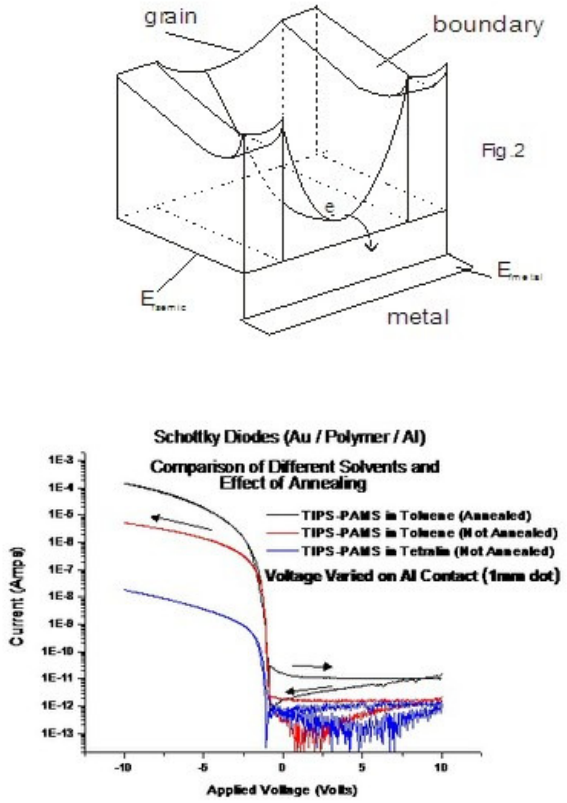
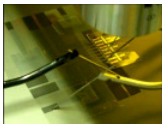


Figure 5. Model used for TIPS pentacene diodes (left) and measurements to collect data for model development (right).



Collaboration 6 – Component integration

The last collaboration has gathered six partners to show that different classes of organic components can be merged into a functional system. A demonstrator (Figure 6) based upon an OTFT transistor and a screen printed electrochromic display, connected via an anisotropic conductive adhesive, has been successfully built and shown to work electrically. Work in 2009 focuses on demonstration of a functioning

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sensor system that converts a sensor signal to a visually detectable output.

For further information please contact Petronella Norberg, petronella.norberg<at>acreo.se

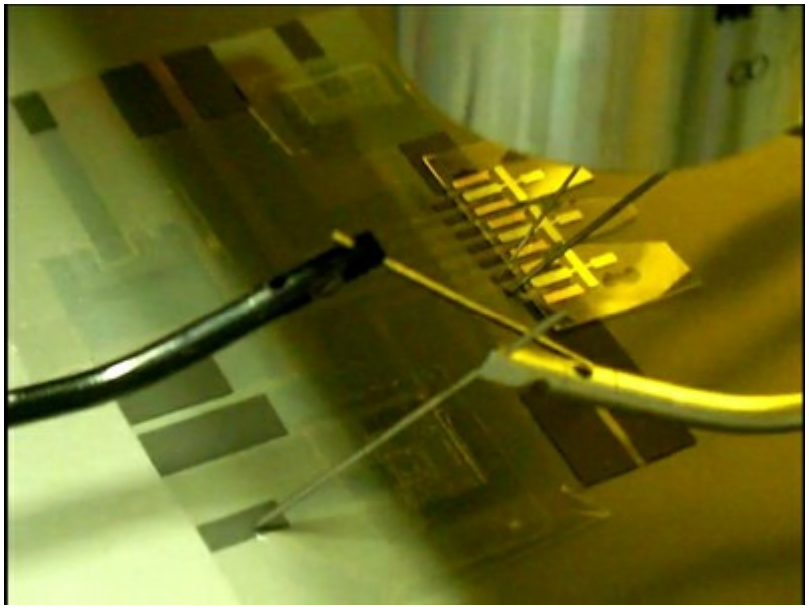

Figure 6. Component integration: Demonstrator system with OTFT and EC display

PolyNet ABOUT

The NoE PolyNet (Network of Excellence for the Exploitation of Organic and Large Area Electronics / OLAE) aims to establish Europe in the OLAE area as the world leader in science, technology development and subsequent commercial exploitation of printing and large area technologies for heterointegration of flexible electronics.

- Overcome fragmentation of European research landscape to foster transfer from science to industry within EU
- Develop concepts for the continuation of research cooperation and service offers for a long-term integration of European research landscape
- Three core platforms to support these aims

Impact is expected not only on the research landscape of Organic and Large Area Electronics but also indirectly on European industry by long-term stimulation of innovative technologies and new companies.

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