SEVENTH FRAMEWORK PROGRAMME THEME 3
Information and Communication Technologies (ICT)
ICT-2009.3.3 – Flexible, organic and large area electronics

POLARIC

Printable, organic and large-area realisation of integrated circuits

Deliverable 3.3

OTFTs with gravure printed dielectric

PUBLIC PART

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[1] R = Report P = Prototype D = Demonstrator O = Other

[2] PU = Public, PP = Restricted to other programme participants (including the Commission Services), RE = Restricted to a group specified by the consortium (including the Commission Services), CO = Confidential, only for members of the consortium (including the Commission Services

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PUBLIC DESCRIPTION OF THE DELIVERABLE

Here we report the successful development within the POLARIC project of a gravure printable, crosslinkable dielectric for n- and p-type organic thin film transistors (OTFTs). The printable dielectric ink is a proprietary research formulation from BASF. The dielectric is also cross-linkable and photopatternable, making it processable using standard fabrication techniques for structuring like spin-coating followed by photolithography. The dielectric approaches state-of-the-art electrical performance at relatively low thicknesses.

The dielectric was deposited via gravure printing and spin-coating — for comparison — in a bottom-gate, bottom-contact thin-film transistor (TFT) architecture. The study showed that gravure printing produces films of comparable structural and electrical quality to conventional spin-coating. The dielectric has the leakage current and dielectric strength required for TFTs in a display backplane application. The surface roughness is also low enough for good organic semiconductor deposition and crystal growth. n- and p-type OTFTs were tested by spin-coating films of small molecules on to the printed dielectric in the bottom-gate, bottom-contact architecture. The resultant transistors had a similar mobility, on/off ratio, turn-on voltage and hysteresis as control devices with the spin-coated dielectric.

We have therefore demonstrated that gravure is a viable fabrication technique for microelectronics applications, and it can deliver electronic-grade dielectric coatings that approach state-of-the-art.