

A BREAKTHROUGH OTFT TECHNOLOGY FEATURING TOP-CONTACT PHOTOLITHOGRAPHY

Imec, in collaboration with Holst Centre, has developed a breakthrough solution which paves the way towards OTFTs (organic thin-film transistors) that can be manufactured using standard flat panel equipment, materials, and processes. Using Fujifilm's innovative organic semiconductor material, imec and Holst Centre have demonstrated an OTFT process flow that is compatible with flat panel display manufacturing and allows low temperature manufacturing. The OTFT device uses top-contact back-channel etch architecture which results in low contact resistance, small TFT dimensions and non-Au electrodes.

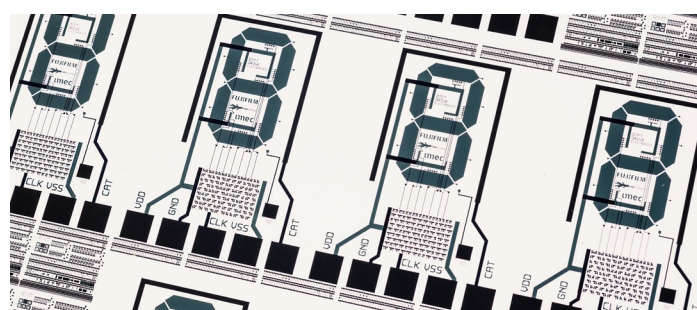
Imec's researchers work with a range of companies across the supply chain of thin-film electronics industry: from material vendors, to flat panel display (FPD) manufacturers, component developers, and innovative application companies. We offer services that allow companies to benchmark new materials for thin-film electronics, develop application prototypes on their basis, and transfer new technology into volume manufacturing.

ELIMINATING BARRIERS FOR INDUSTRIAL IMPLEMENTATION

By leveraging established techniques for vacuum deposition and photolithography, imec's process is compatible with existing manufacturing facilities and optimized for maximum compatibility with standard equipment. Additionally, we have achieved material compatibility via Au-free processes using standard copper OTFT electrodes.

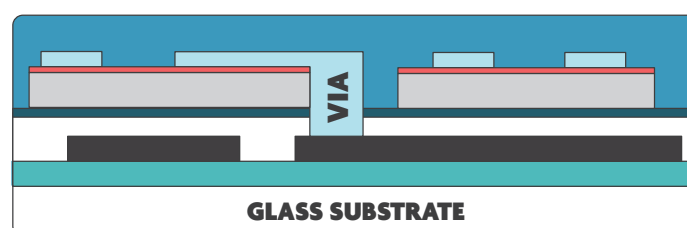
TOP CONTACT, LOW TEMPERATURE MANUFACTURING FOR SMALLER, FASTER OTFTs

Small and fast OTFTs manufactured at low temperature on arbitrary surfaces is a viable option for display integrated fingerprint scanners and driving circuitry.



OTFT-based IC demonstrator – integrated control and driving of OLED signage

- DIELECTRIC
- BUFFER LAYER
- INTERLAYER
- S-D STACK
- GATE STACK
- SAM LAYER
- C4-TBBT
- INJECTION LAYER



Top-contact back channel etch (BCE) architecture

TECHNOLOGY

- Organic TFT technology with lithographically-defined top contacts

KEY BENEFITS

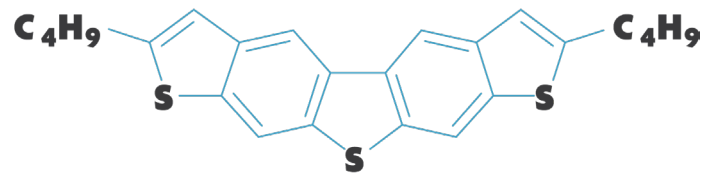
- Compatible with flat panel display manufacturing via back channel etch (BCE) flow
- Low contact resistance enabled by top contacts with integrated doping layers
- Small TFT dimensions enabled by the low contact resistance
- Low temperature manufacturing of pixel arrays and integrated circuits
- Non-Au electrodes (Cu) in development

OUR OFFERINGS

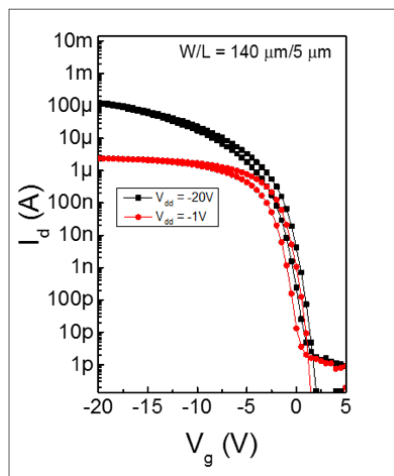
- Benchmark your novel materials: we can develop custom process flow and TFT device architectures to characterize your novel transistor materials to benchmark it against state-of-the-art performance and application requirements.
- Co-develop with us: we can work with you to develop next-generation OTFT-based applications. We can engage with you in circuits and system design, prototyping and demonstrator development, low volume manufacturing and transferring the process to external foundries for high volume manufacturing.

APPLICATIONS

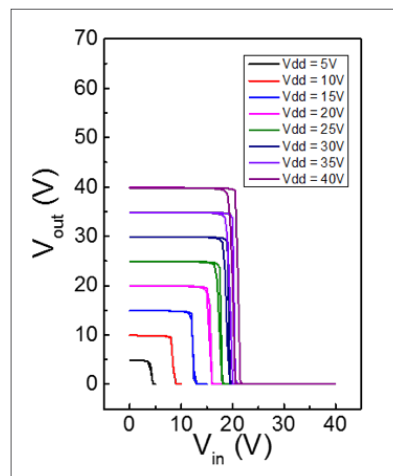
- Biometrics: large area and flexible finger print and palm scanners, may be intergrated in smartphone screens
- Consumer electronics, wearables and IoT: flexible displays, digital signage and smart packaging



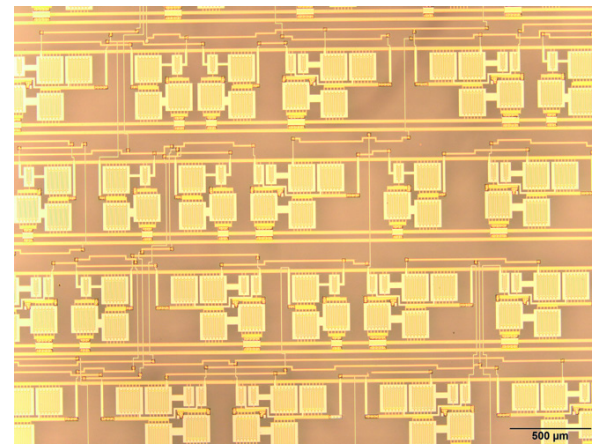
Organic semiconductor C4-TBBT (C4-thieno[3,2-f:4,5-f']bis[]benzothiophene, FUJIFILM Wako Pure Chemical Corporation)



Transfer curves of fully-integrated top-contact OTFT in linear and saturation region with mobility $>1 \text{ cm}^2/\text{Vs}$



Voltage transfer curve of the inverter with fully-integrated top-contact OTFTs



Microscope image of the OTFT-based driver IC for OLED signage

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