

Imec unveils fully organic imager for X-ray applications

June 13 2013



Fully-organic, flexible imager developed by imec, Holst Centre and Philips Research

At this week's International Image Sensor Workshop (IISW 2013, Snowbird, Utah, June 12-16 2013), imec and Holst Centre presented a large-area fully-organic photodetector array fabricated on a flexible substrate. The imager is sensitive in the wavelength range suitable for x-ray imaging applications.

Because of their very high absorption coefficient, organic semiconductors allow extremely thin active layers (10 to 50 nm). Also, given their low processing temperature, they can be processed on foils. As a result, organic imagers can be more robust and light-weight compared to their traditional counterparts and may be used for conformal coating of randomly shaped substrates. Moreover, the wide variety of organic molecules available ensures that the properties of the active layer can be tuned to applications requiring specific wavelength ranges.

The presented imager is sensitive in the [wavelength range](#) between 500 and 600 nm, making it compatible with typical scintillators and therefore suitable for x-ray imaging applications. It was fabricated by thermally evaporating an ultrathin (submicron) photosensitive layer of small [organic molecules](#) (SubPc/C₆₀) on top of an organic readout circuit. A semi-transparent top contact enables front-side illumination. The readout backplane was manufactured on six inch foil-laminated wafers. It consists of pentacene-based thin-film transistors (TFTs) in arrays of 32x32 pixels with varying pitch (1 mm and 200 μm). To prevent degradation of the organic semiconductors in the air, the photodetector array is encapsulated. The imager was characterized under illumination with a calibrated green light-emitting diode (LED), yielding a linearly increasing [photocurrent](#) from the incident power of 3 $\mu\text{W}/\text{cm}^2$. Dark [current density](#) is below $10^{-6} \text{ A}/\text{cm}^2$ at a bias voltage of -2V.

"This latest achievement is a significant step forward in not only finding the optimal materials, but pinpointing the best ways to process materials into reliable organic circuits and systems with state-of-the-art performance," said Paul Heremans, technology director at the [imec](#) /Holst Centre. "Once again, we're proud to demonstrate how imec's top-notch research leads to relevant industrial solutions, and subsequently brings added value to our partners' businesses."

This research results are presented in collaboration with Philips Research, at the (2013 International Image Sensor Workshop (IISW), sponsored by the International Image Sensor Society (IIS), June 12-16, 2013.

More information: www.imec.be/

Provided by IMEC

Citation: Imec unveils fully organic imager for X-ray applications (2013, June 13) retrieved 24 May 2024 from <https://phys.org/news/2013-06-imec-unveils-fully-imager-x-ray.html>

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