

# Philips improves inkjet-printing for large-screen polymer OLED displays

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Scientists at Philips have designed and built a new high-precision inkjet printer for polymer Organic Light-Emitting Diode (OLED) displays. The fully automated system uses four multi-nozzle print heads on a single common stage to accurately print the required polymer OLED layers in air, which results in a simpler process with fewer process steps and higher accuracy. The inkjet printer can handle substrates of up to 24 inch, but can easily be scaled to large substrates, demonstrating the possibility to develop a low-cost solution for making large polymer OLED displays.

OLED displays hold the promise to play a significant role in the flat-TV market, offering an excellent image quality (high contrast, large viewing angle, fast response time) combined with an ultra-thin form factor and low power consumption. With polymer-based OLED displays, inkjet printing can be used to pattern the required OLED layers on a substrate from solution, providing a low-cost, scalable technique for making large-screen displays.

In cooperation with polymer OLED material suppliers and print head manufacturer Spectra, Philips has developed a prototype of an inkjet printing system using four print-heads equipped with 256 piezo-driven nozzles each, enabling the production of large-screen, full-colour OLED displays with high accuracy and reliability. The system uses a novel, single-step printing method in which each sub-pixel (R, G or B pixel) is built up from multiple droplets, fired from different nozzles, averaging out nozzle-to-nozzle variations. This leads to high-precision deposition

of the display pixels with an accuracy of 1  $\mu\text{m}$  and improved layer uniformity from pixel-to-pixel better than 2%, resulting in excellent, uniform brightness characteristics of the display. The current prototype system is capable of printing displays up to 24 inches, but larger displays are possible simply by increasing the size of the inkjet printer. To demonstrate the feasibility of inkjet printing for manufacturing large-screen polymer OLED displays, Philips has successfully utilized this technology to produce a full-colour, 13-inch active-matrix display prototype with excellent picture quality.

While currently being applied for large-area polymer OLED displays, both on glass or flexible plastic substrates, inkjet printing also offers significant opportunities in other application areas requiring high-resolution patterning of functional materials from solution, for example in the biomedical area for the assembly of biosensors.

The original press release can be found on [www.philips.com](http://www.philips.com)

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