Cheaper Big-Screen OLEDs

New organic display materials can be printed with ink-jets.

By Katherine Bourzac Friday, June 05, 2009

High-end displays made from organic materials are lightweight, energy efficient, and crisp--but it has proved difficult to manufacture them cheaply and durably.

Longer life: DuPont has developed longer-lasting OLED materials that can be printed using cheap, simple techniques to make displays like this one.
Credit: DuPont

Now the chemical giant DuPont is reporting the development of long-lasting organic-display materials that can be printed cheaply over large areas, much like ink. DuPont says that these materials can be used to make cheaper high-end displays with existing equipment, and the company says that it is in talks with display manufacturers to bring them to market.

Each pixel in an organic light-emitting diode (OLED) is made up of materials that emit red, green, and blue light in response to electrical stimulation via a thin-film transistor backplane.

OLED displays on the market today are made by depositing organic materials in a vapor through a mask. This setup ensures that differently colored subpixels are properly aligned, but the process is expensive, because some material inevitably gets lost, and difficult to do over large areas. For this reason, OLEDs have so far found their way into only a few products, including a Sony television and some Samsung cell phones.

An alternative approach is solution deposition, which involves printing liquid organic materials onto a surface. Several companies and university research groups have been trying to develop such printable OLED materials, but it's difficult to make light-emitting

materials that last long enough to bring them to market: the display quality tends to degrade too quickly.

"If one could get high performance from solution-deposition methods, it would be very attractive: it would solve the scaling issues" associated with making these displays, says Nick Colaneri, director of the Flexible Display Center at Arizona State University, in Tempe. "Now DuPont claims to have solved that problem."

This week at the Society for Information Display (SID) Symposium, in San Antonio, DuPont is presenting OLED materials that can be printed in solution and that make longer-lasting displays. DuPont is disclosing not the composition of the materials or how they are printed. However, the lifetimes of the materials, which the company has disclosed, "are indeed impressive," says Samson Jenekhe, a professor of chemical engineering at the University of Washington, Seattle. For example, the lifetime of the green material involved is more than a million hours, which DuPont says is a record. The efficiency and color purity of the materials, says Jenekhe, are comparable to those of the state-of-the-art organic displays on the market.

Vladimir Bulović, an associate professor of electrical engineering at MIT and a cofounder of QD Vision, a startup company that makes lighting and displays using quantum dots, says, "Since they aim to produce displays, the key will be to understand the deposition and pixelation method they intend to use." DuPont says that the materials are laid down using a high-speed nozzle printer developed with Dainippon Screen, a Kyoto electronics company.

Colaneri adds that, to his knowledge, no solution-printed OLED displays are currently on the market. But other companies are also trying to tackle the problem. Indeed, Sumitomo executives reported at the SID event that they have been shipping solution-printable polymers for displays. Sumitomo also recently acquired U.K. company Cambridge Display Technologies, which makes polymer-based displays. And Universal Display Corporation of Ewing, NJ, is also reporting long-lifetime green display materials at the conference.

William Feehery, global business director of DuPont OLED Displays says that DuPont is currently in discussions with several display companies interested in commercializing its new OLED materials. "They already have the manufacturing infrastructure to make these on glass," he says. The company also plans to look into making flexible displays using the technology.

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