SEMICONDUCTORS // DEVICES

NEWS

Flexible Inorganic LED Displays

Printed compound semiconductors could challenge OLEDs, say researchers

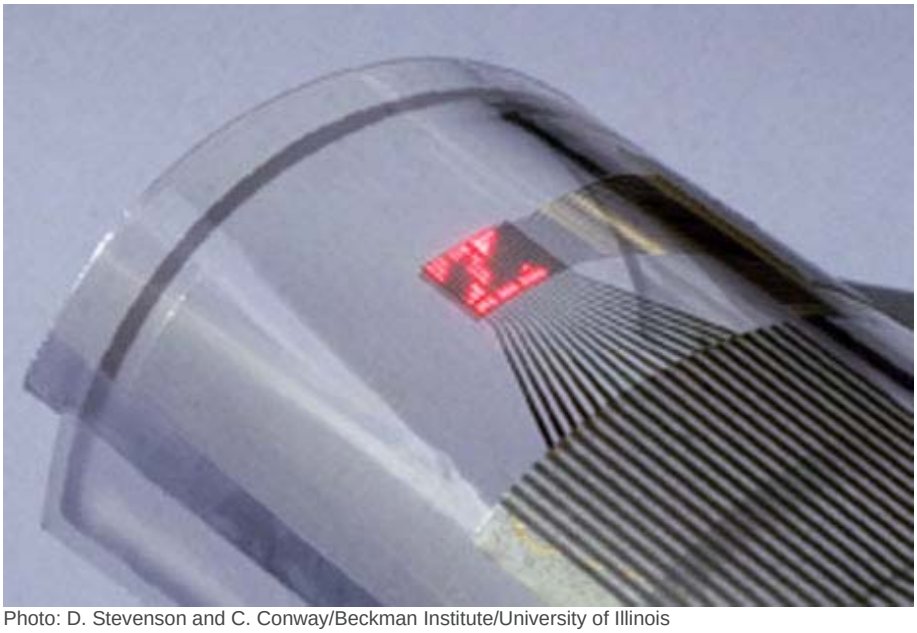

Photo: D. Stevenson and C. Conway/Beckman Institute/University of Illinois

An inorganic LED display printed on a flexible substrate bends without breaking

BY WILLIE JONES // AUGUST 2009

21 August 2009—Organic light-emitting diodes, or OLEDs, are seen as the successor to liquid crystal technology for small, pixel-dense displays like the ones in laptops, smartphones, and digital cameras. Conventional inorganic LEDs, which are poised to put incandescent and fluorescent lightbulbs out to pasture, have never been in the race, because the processing techniques used to make them don't allow scaling down to the resolution required for a pocket-size display.

But a group made up of researchers based in Illinois and Beijing reported yesterday in the online edition of *Science* that they have developed methods for creating, assembling, and connecting inorganic LEDs on a flexible substrate. This will finally allow the miniaturization of the technology, which beats OLEDs in brightness, energy efficiency, durability, and moisture resistance.

The technology was developed as part of a research project funded by the Ford Motor Co., which envisions many possible automotive applications for thin, flexible lighting systems. Among these are instrumentation gauges that can be placed just about anywhere.

The researchers started by growing a four-layer semiconductor sandwich with all the makings of an inorganic LED. They did this atop a layer of aluminum arsenide which itself coated a gallium arsenide substrate. Using a combination of photolithography, chemical etching, and a proprietary polymer process, they turned the wafer into an array of 100-by-100-micrometer LEDs loosely attached to the gallium arsenide by polymer anchors.

The team then used an automated printing tool composed of a soft rubber stamp with embossed features that act as suction cups. The cups attach to the tops of the LEDs, and when the stamp is peeled away, the polymer anchors break. The stamp then deposits the LEDs on a glass substrate coated with an adhesive strong enough to overcome the suction force.

The researchers say the device can also be printed onto flexible substrates instead of glass to cover objects with curves or corners. Rogers has done pioneering work in making flexible electronic circuits and has founded a firm—Semprius, in Durham, N.C.—to commercialize it.

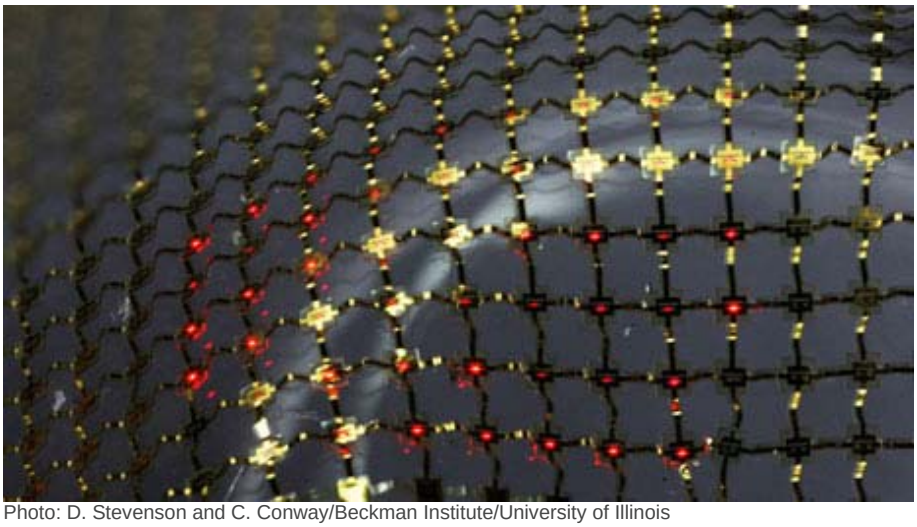

Photo: D. Stevenson and C. Conway/Beckman Institute/University of Illinois

An inorganic LED array hugs the curves of an irregularly shaped object

Displays produced from this printing process are highly efficient, says Rogers, who explains that you can achieve the same brightness and image clarity with a lot less material than that used in OLEDs. The 16 -by-16 array the team produced has a total surface area of 325 square millimeters. The LEDs together take up less than 1 percent of that real estate, he says. And the LED devices can be made even smaller than the 100-µm-edged version; the techniques the team used are compatible with devices as small as 10 µm on a side.

However, such small LED sizes do not improve picture quality in any way, because the human eye can't resolve anything smaller than about 100 µm across, says Rogers. "This is all about making the devices lighter and cheaper," he says. As a bonus, such displays would be almost completely transparent—and well suited for another automotive need: inexpensive head-up displays.

most recent comments

CHRIS **08.27.2009**
Over the years there have been a lot of "breakthrough" announcements for this technology claiming that flexible displays are right around the corner, but it never materializes. Time will tell whether this is another in a long line of smoke puffs or whether it's suited to production and field environments and whether it's cost competitive..

BRAD GURMAN **08.26.2009**
Fantastic, IF it works in production..

CARLOS **08.25.2009**
The technology was developed as part of a research project funded by the Ford Motor Co., which envisions many possible automotive applications for thin, flexible lighting systems. Among these are instrumentation gauges that can be placed just about anywhere..

SEMICONDUCTORS // DEVICES

NEWS

Flexible Inorganic LED Displays

Printed compound semiconductors could challenge OLEDs, say researchers

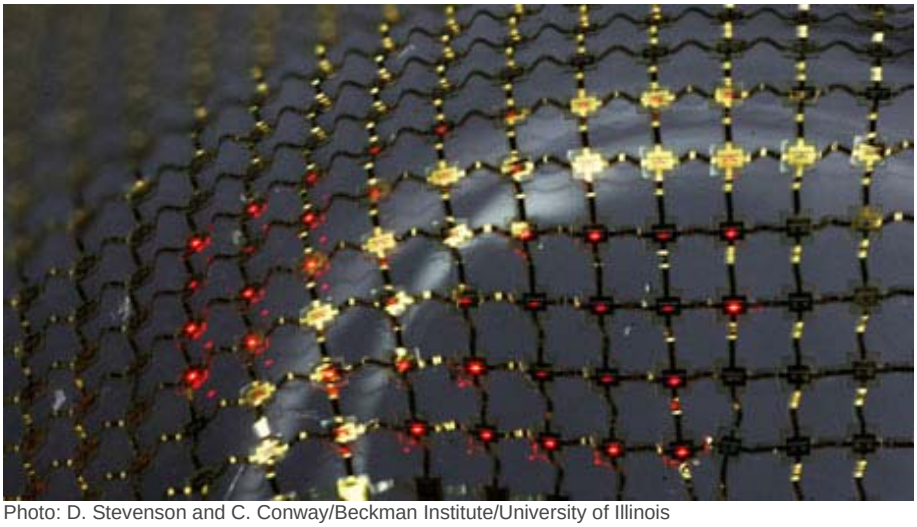

Photo: D. Stevenson and C. Conway/Beckman Institute/University of Illinois

An inorganic LED array hugs the curves of an irregularly shaped object

BY WILLIE JONES // AUGUST 2009

The researchers say the device can also be printed onto flexible substrates instead of glass to cover objects with curves or corners. Rogers has done pioneering work in making flexible electronic circuits and has founded a firm—Semprius, in Durham, N.C.—to commercialize it.

Displays produced from this printing process are highly efficient, says Rogers, who explains that you can achieve the same brightness and image clarity with a lot less material than that used in OLEDs. The 16-by-16 array the team produced has a total surface area of 325 square millimeters. The LEDs together take up less than 1 percent of that real estate, he says. And the LED devices can be made even smaller than the 100-µm-edged version; the techniques the team used are compatible with devices as small as 10 µm on a side.

However, such small LED sizes do not improve picture quality in any way, because the human eye can't resolve anything smaller than about 100 µm across, says Rogers. "This is all about making the devices lighter and cheaper," he says. As a bonus, such displays would be almost completely transparent—and well suited for another automotive need: inexpensive head-up displays.

most recent comments

CHRIS 08.27.2009
Over the years there have been a lot of "breakthrough" announcements for this technology claiming that flexible displays are right around the corner, but it never materializes. Time will tell whether this is another in a long line of smoke puffs or whether it's suited to production and field environments and whether it's cost competitive..

BRAD GURMAN 08.26.2009
Fantastic, IF it works in production..

CARLOS 08.25.2009
The technology was developed as part of a research project funded by the Ford Motor Co., which envisions many possible automotive applications for thin, flexible lighting systems. Among these are instrumentation gauges that can be placed just about anywhere..