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Scientists Create Flexible, Inorganic LED Displays

By Barry Levine
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Scientists report a new method has been developed to create microscale inorganic LEDs, with flat or wavy configurations possible. The team wanted to find a way to grow and shape inorganic LEDs because of their brightness and sturdiness. Flexible LED displays will allow business and consumer users to have large-screen displays in their pockets.

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Cars with video displays on their sides that show up only when the video plays. Pocket-sized video screen roll-ups. Wall-hanging TVs -- across an entire wall -- that are as thin as cardboard. These are only some of the possible uses for a new form of LED display, reported today by a scientific team in Science magazine.

The team of 16 scientists, led by materials scientist John Rogers of the University of Illinois at Urbana-Champaign, report that they have "developed methods for creating microscale inorganic light-emitting diodes (LEDs)," as well as ways to turn the LEDs into "unusual display and lighting systems." Flat or wavy configurations are possible, with dimensions down to the micrometers, and "printing-based assembly methods can deposit these devices" onto glass, plastic or rubber.

Best Parts of Organic and Inorganic LEDs

This latest type of LED is brighter, more flexible, and can be arranged in more shapes and sizes than current LCD or organic LEDs.

Organic LEDs are used in cell phones and game consoles, while inorganic ones are used in those video billboards that have been sprouting up alongside highways. Organic LEDs, which are called organic because they contain carbon, are not as bright or as sturdy as the billboard kinds, but inorganic LEDs have to be sliced and assembled by robots because of their thickness.

The team of scientists, representing institutions from the U.S., China and Singapore, sought to combine the advantages of each. In order to do that, the team wanted to find a way to grow and shape inorganic LEDs.

They first created what Rogers called a "sacrificial layer" -- an adhesive that holds the inorganic LEDs on a wafer while they are being created, but is partially removed with a liquid later. The layer of LEDs can then be lifted up from the wafer. Then, with a rubber stamping device, the team grabbed the inorganic LED crystals and stamped them onto

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bendable sheets.

The sheets, made of rubber, plastic or glass, are connected to the conductors and insulators that the LEDs need, and -- voilà! -- you have a flexible, bright LED membrane. Because they're brighter than organic LEDs, fewer are needed to create the same level of display.

'Cool' To Live in the 21st Century

Spacing the LEDs out even more allows the surface to become essentially transparent, except when the LEDs are turned on. Some observers are suggesting that the technology could be used, for instance, to put flexible, transparent-when-off video displays into textiles.

The study was initiated by the Ford Motor Co., which wanted to develop a third brake light that could be a strip of LEDs along a car bumper.

This research "shows once again how cool it is to live in the 21st century," said Michael Gartenberg, vice president at industry research firm Interval Research.

New, flexible LED displays would meet the demands of consumers and businesses, he said, who would love to have "large-screen displays in their pockets." With processor performance and transmission speeds for mobile devices having increased dramatically over the last few years, display size is a key bottleneck.

And, with all the advances on the LED display front, Gartenberg said, "it certainly seems like we're moving toward having LED displays" becoming much more prominent than they are now.

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