

New research could lead to 'invisible' electronics

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Imagine a car windshield that displays a map to your destination, military goggles with targets and instructions displayed right before a soldier's eyes or a billboard that doubles as a window.

Only in science fiction you say? Northwestern University researchers report that by combining organic and inorganic materials they have produced transparent, high-performance transistors that can be assembled inexpensively on both glass and plastics.

The results of this breakthrough, which brings such futuristic high-quality displays closer to reality, were published in the November 2006 issue of the journal *Nature Materials*.

Researchers have long worked on developing new types of displays powered by electronics without visible wires. But, until now, no one was able to develop materials for transistors that could be "invisible" while still maintaining a high level of performance.

"Our development provides new strategies for creating transparent electronics," said Tobin J. Marks, the Vladimir N. Ipatieff Research Professor in Chemistry in the Weinberg College of Arts and Sciences at Northwestern and professor of materials science and engineering, who led the research. "You can imagine a variety of applications for new electronics that haven't been possible previously -- imagine displays of text or images that would seem to be floating in space."

Transistors are used for all the switching and computing necessary in electronics, and, in displays, they are used to power and switch the light sources.

High-performance, transparent transistors could be combined with existing kinds of light display technologies, such as organic light-emitting diodes, liquid crystal displays (LCDs) and electroluminescent displays, which are already used in televisions, desktop and laptop computers and cell phones.

To create their thin-film transistors, Marks' group combined films of the inorganic semiconductor indium oxide with a multilayer of self-assembling organic molecules that provides superior insulating properties.

The indium oxide films can be fabricated at room temperature, allowing the transistors to be produced at a low cost. And, in addition to being transparent, the transistors outperform the silicon transistors currently used in LCD screens and perform nearly as well as high-end polysilicon transistors.

Prototype displays using the transistors developed at Northwestern could be available in 12 to 18 months, said Marks. He has formed a start-up company, Polyera, to bring this and related technologies to market.

Source: Northwestern University

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