

Home > News > Daily News Archive > 2009 > August > 20 August (Berardelli)

A Thousand Pinpoints of Light

By Phil Berardelli ScienceNOW Daily News 20 August 2009

Imagine cardboard-thin TV screens that stretch across entire walls or portable video screens that can be rolled up when not in use. Those are some of the possible applications for tiny, inorganic light-emitting diodes (LEDs) that researchers have developed. The new LEDs are just as thin as conventional organic LEDs and liquid-crystal displays, but they're much brighter and more versatile.

In the world of LEDs, there's bright or there's cheap, but not both. Organic LEDs, such as those in cell phones and portable computer game systems, use carbon-based, thinfilm materials as their main ingredient and thus can be manufactured cheaply in much the same way as computer chips. Inorganic LEDs, such as those used in outdoor

video billboards, are based on gallium arsenide and gallium nitride; they're more rugged and much brighter, but they're also much thicker, so they must be cut and assembled individually by robots. The question has been how to combine the advantages of both display types into a single source of lighting.

That's what a team from institutions in China, Singapore, and the United States set out to do. "We wanted to see if we could use inorganic LEDs in ways that exploit some of the processing advantages of organic LEDs," says materials scientist and co-author John Rogers of the University of Illinois, Urbana-Champaign. The challenge, Rogers explains, was to find a way to grow, shape, and manipulate the inorganic LED devices en masse, because doing so would eliminate the need to cut and connect them individually--a cumbersome task when hundreds or thousands of the devices are involved.

As Rogers and colleagues report tomorrow in Science, they first created what they call a "sacrificial layer" in the manufacturing process. It's a weak adhesive that holds the LEDs in place while they form, but then it's partially dissolved away by an etching liquid. Next, a rubber stamping device presses down on and grabs hold of a bunch of the crystals. The stamping device picks up the LEDs and deposits them onto flexible sheets of glass, plastic, or rubber, where they are integrated with the conductors and insulators that will allow the lighting array to function. The result is a thin, flexible array that's much brighter than conventional organic LED arrays.

Rogers says the material for the inorganic LED arrays, square centimeter by square centimeter, is still more expensive than its organic LED counterparts. But because the inorganic diodes are so much brighter, far fewer are needed to create a display of equivalent brightness--and therefore the cost of the inorganic LED arrays is comparable.

The ability to manufacture and assemble inorganic LED elements as described in the paper will yield "amazingly flexible and robust membranes," says materials scientist Boris Yakobson of

Enlarge Image





ADVERTISEMENT

ADVERTISEMENT

Bright points. A new process allows tiny LEDs to be printed onto a glass cylinder or a thin sheet of plastic (*inset*).

CREDIT: SANG-IL PARK *ET AL.*, *SCIENCE*

Rice University in Houston, Texas. Although based on relatively simple mechanics, he says, the concept raises "tantalizing possibilities," such as weaving optical electronics into textilessomething Yakobson says could "offer a new variety of applications in this industry, which is striving for a high-tech revolution."

(skip to comments for this article)

Previous Article

Post

Cancel

The editors suggest the following Related Resources on *Science* sites: In *Science* Magazine

REPORTS

Printed Assemblies of Inorganic Light-Emitting Diodes for Deformable and Semitransparent Displays

Sang-II Park, Yujie Xiong, Rak-Hwan Kim, Paulius Elvikis, Matthew Meitl, Dae-Hyeong Kim, Jian Wu, Jongseung Yoon, Chang-Jae Yu, Zhuangjian Liu, Yonggang Huang, Keh-chih Hwang, Placid Ferreira, Xiuling Li, Kent Choquette, and John A. Rogers (21 August 2009) *Science* **325** (5943), 977. [DOI: 10.1126/science.1175690]

Abstract » Full Text » PDF » Supporting Online Material »

Comments

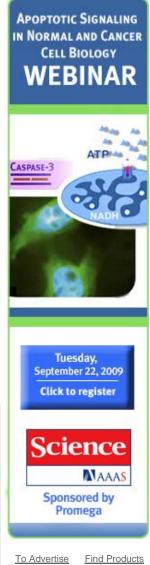
Follow

Thanks for your feedback. Please keep it polite and to the point.

From Guest

To This Page

What's on your mind...



Magazine | News | Signaling | Careers | Multimedia | Collections | Help | Site Map | RSS Subscribe | Feedback | Privacy / Legal | About Us | Advertise With Us | Contact Us

© 2009 American Association for the Advancement of Science. All Rights Reserved. AAAS is a partner of <u>HINARI</u>, <u>AGORA</u>, <u>PatientInform</u>, <u>CrossRef</u>, and <u>COUNTER</u>.