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Flexible high-resolution home theatre displays come closer to reality

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(ANI)

Washington, August 21 : You may soon get to enjoy facilities like flexible high-resolution home theatre displays, wearable health monitors, and biomedical imaging devices because scientists are working on a novel process for creating new classes of lighting and display systems.

John Rogers, the Flory-Founder Chair Professor of Materials Science and Engineering at the University of Illinois, has revealed that the new process is all about creating and assembling ultrathin, ultrasmall inorganic light-emitting diodes (LEDs) into large arrays offers new classes of lighting and display systems with interesting properties, such as see-through construction and mechanical flexibility.

He said that such properties would be impossible to achieve with existing technologies.

"Our goal is to marry some of the advantages of inorganic LED technology with the scalability, ease of processing and resolution of organic LEDs," said Rogers.

Compared to their organic counterparts, inorganic LEDs are brighter, more robust and longer-lived.

Organic LEDs, however, are attractive because they can be formed on flexible substrates, in dense, interconnected arrays.

Rogers and his colleagues-including collaborators from Northwestern University, the Institute of High Performance Computing in Singapore, and Tsinghua University in Beijing-say that the new technology combines features of both.

"By printing large arrays of ultrathin, ultrasmall inorganic LEDs and interconnecting them using thin-film processing, we can create general lighting and high-resolution display systems that otherwise could not be built with the conventional ways that inorganic LEDs are made, manipulated and assembled," Rogers said.

To overcome requirements on device size and thickness associated with conventional wafer dicing, packaging and wire bonding methods, the researchers have developed epitaxial growth techniques for creating LEDs with sizes up to 100 times smaller than usual.

They have also developed printing processes for assembling these devices into arrays on stiff, flexible, and stretchable substrates.

To create an array, a rubber stamp contacts the wafer surface at selected points, lifts off the LEDs at those points, and transfers them to the desired substrate.

"The stamping process provides a much faster alternative to the standard robotic 'pick and place' process that manipulates inorganic LEDs one at a time. The new approach can lift large numbers of small, thin LEDs from the wafer in one step, and then print them onto a substrate in another step," Rogers said.

The researcher says that shifting position and repeating the stamping process can transfer LEDs to other locations on the same substrate, and, in this fashion, large light panels and displays can be crafted from small LEDs made in dense arrays on a single, comparatively small wafer.

Given that the LEDs can be placed far apart and still provide sufficient light output, Rogers says that the panels and displays can be nearly transparent.

He even envisions the creation of flexible and even stretchable sheets of printed LEDs, which can have potential use in the health-care industry.

"Wrapping a stretchable sheet of tiny LEDs around the human body offers interesting opportunities in biomedicine and biotechnology, including applications in health monitoring, diagnostics and imaging," Rogers said.

A research article describing the researchers' work has been published in the journal Science.

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