Team develops flexible blue vertical micro LEDs

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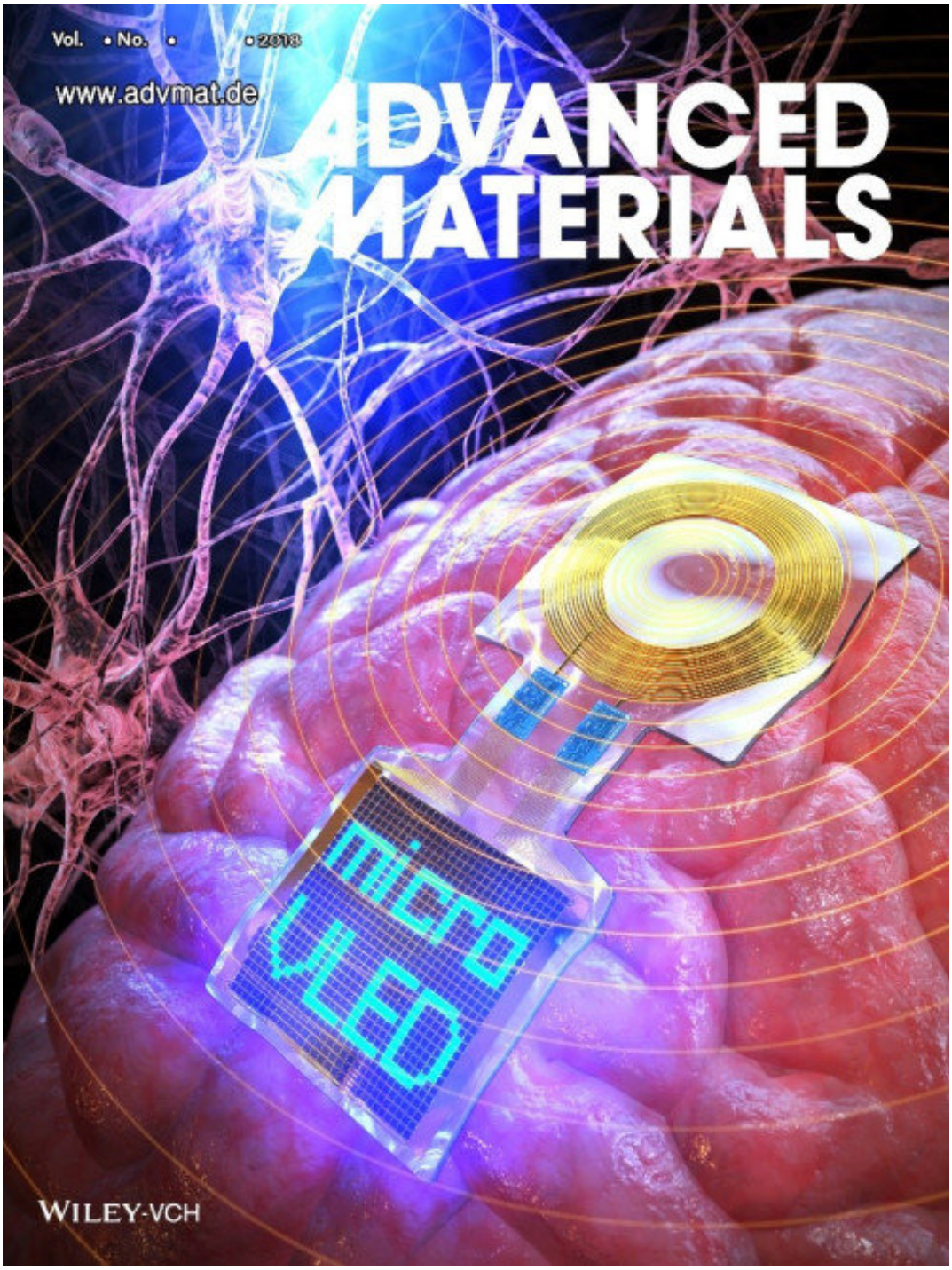

This is a schematic image of wireless thin-film blue f-VLED arrays on the brain surface. Credit: KAIST

A KAIST research team has developed a technology that will advance the commercialization of micro LEDs. Professor Keon Jae Lee from the Department of Materials Science and Engineering and his team have developed a low-cost production technology for thin-film blue flexible vertical micro LEDs (f-VLEDs).

At CES 2018, micro LED TV technology was spotlighted as a strong candidate for replacing active-matrix organic light-emitting diode (AMOLED) displays. Micro LED is a sub-100 um light source for red, green and blue light, which has outstanding optical output, ultra-low power consumption, fast response speed, and excellent flexibility.

However, the current display industry uses the individual chip transfer of millions of LED pixels, which carries high production costs. Therefore, the initial market of micro LED TV will be estimated at around $100,000 for the global premium market. To widely commercialize micro LEDs for mobile and TV displays, the transfer method of thin film micro LEDs requires a one-time transfer of one million LEDs.

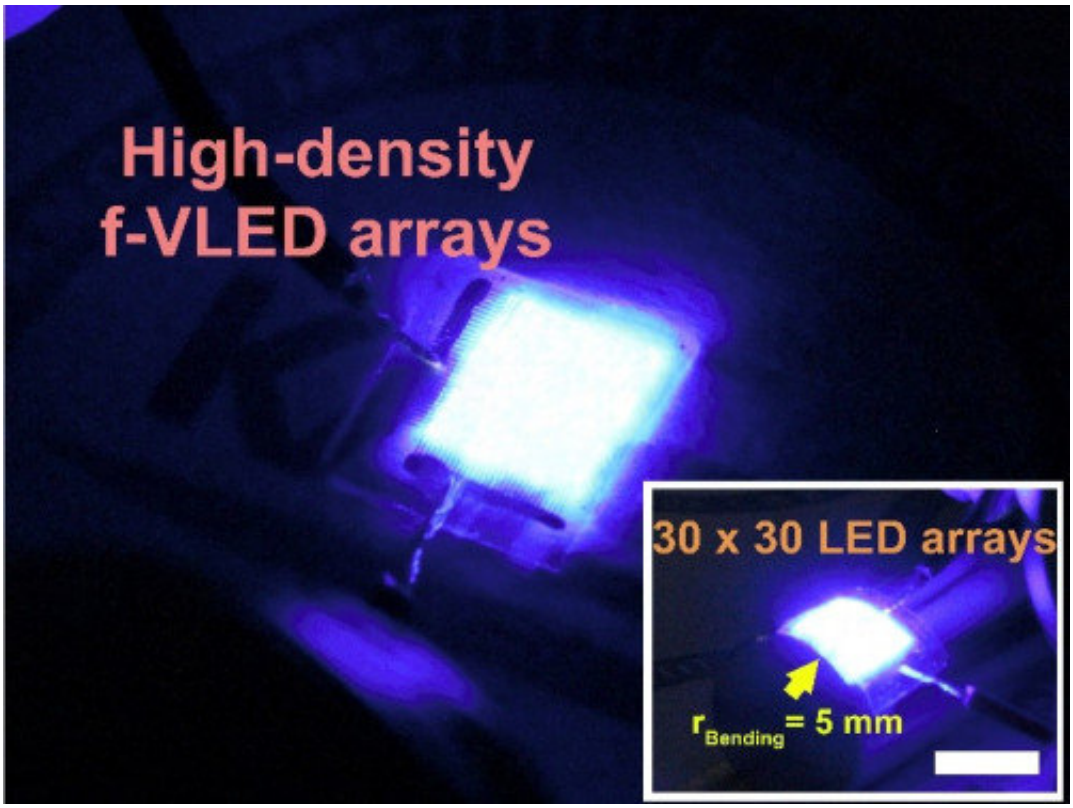

Photo of high-performance and high-density blue f-VLED arrays. Credit: KAIST

The team previously developed a thin-film red f-VLED in previous projects, and has now realized thousands of thin-film blue vertical micro LEDs on plastics using a one-time transfer. The blue GaN f-VLEDs achieved optical power density (~30 mW/mm ^{2}), three times higher than that of lateral micro LEDs, and a device lifetime of 100,000 hours by reducing heat generation. These blue f-VLEDs could be conformally attached to the curved skin and brains for wearable devices, and stably operated by wirelessly transferred electrical energy.

Professor Lee said, "For future micro LEDs, the innovative technology of thin-film transfer, efficient devices, and interconnection is necessary. We plan to demonstrate a full-color micro LED display in smart watch

sizes by the end of this year."

More information: Han Eol Lee et al, Monolithic Flexible Vertical GaN Light-Emitting Diodes for a Transparent Wireless Brain Optical Stimulator, *Advanced Materials* (2018). DOI: 10.1002/adma.201800649