Flexible drug delivery microdevice to advance precision medicine

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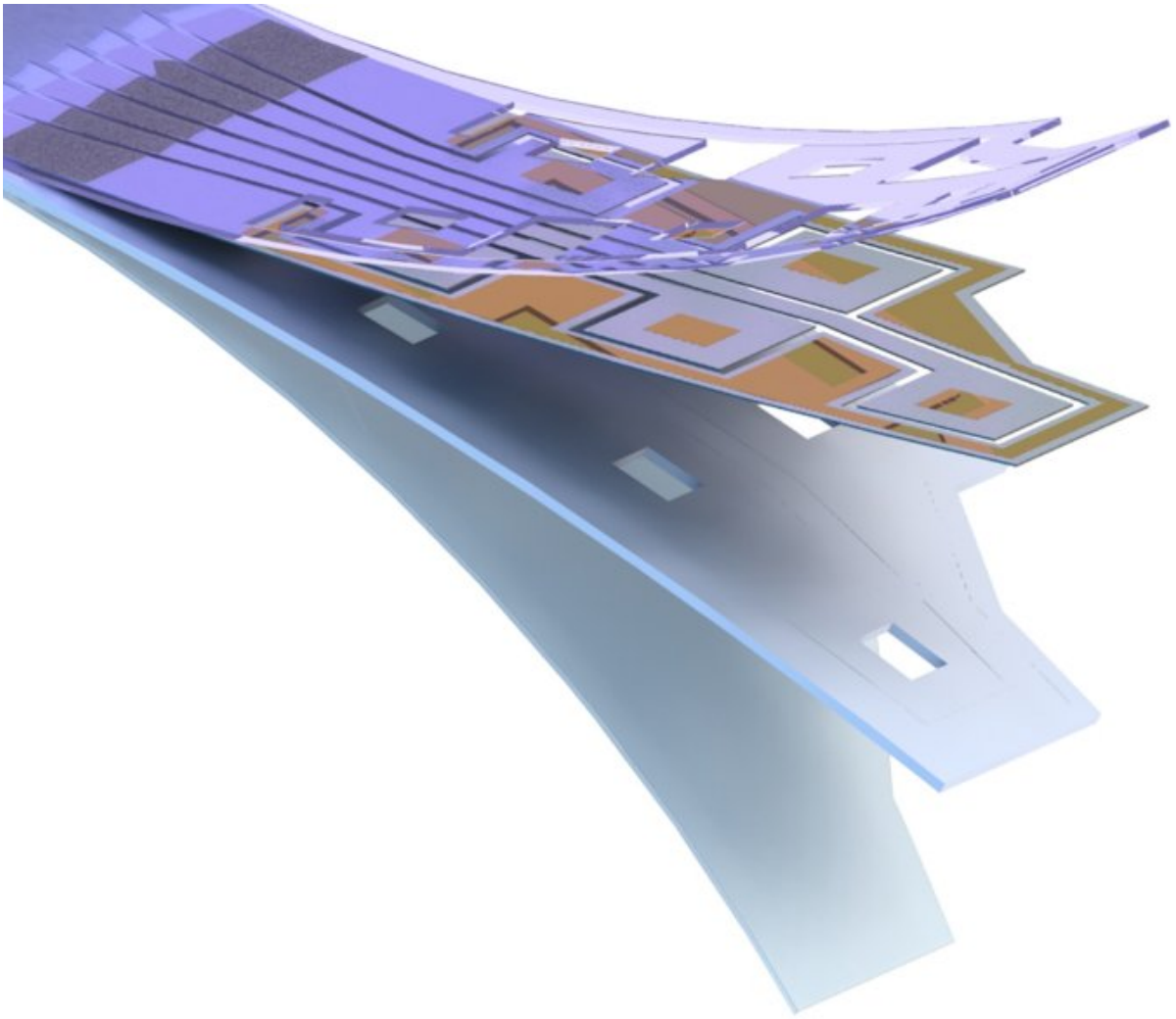
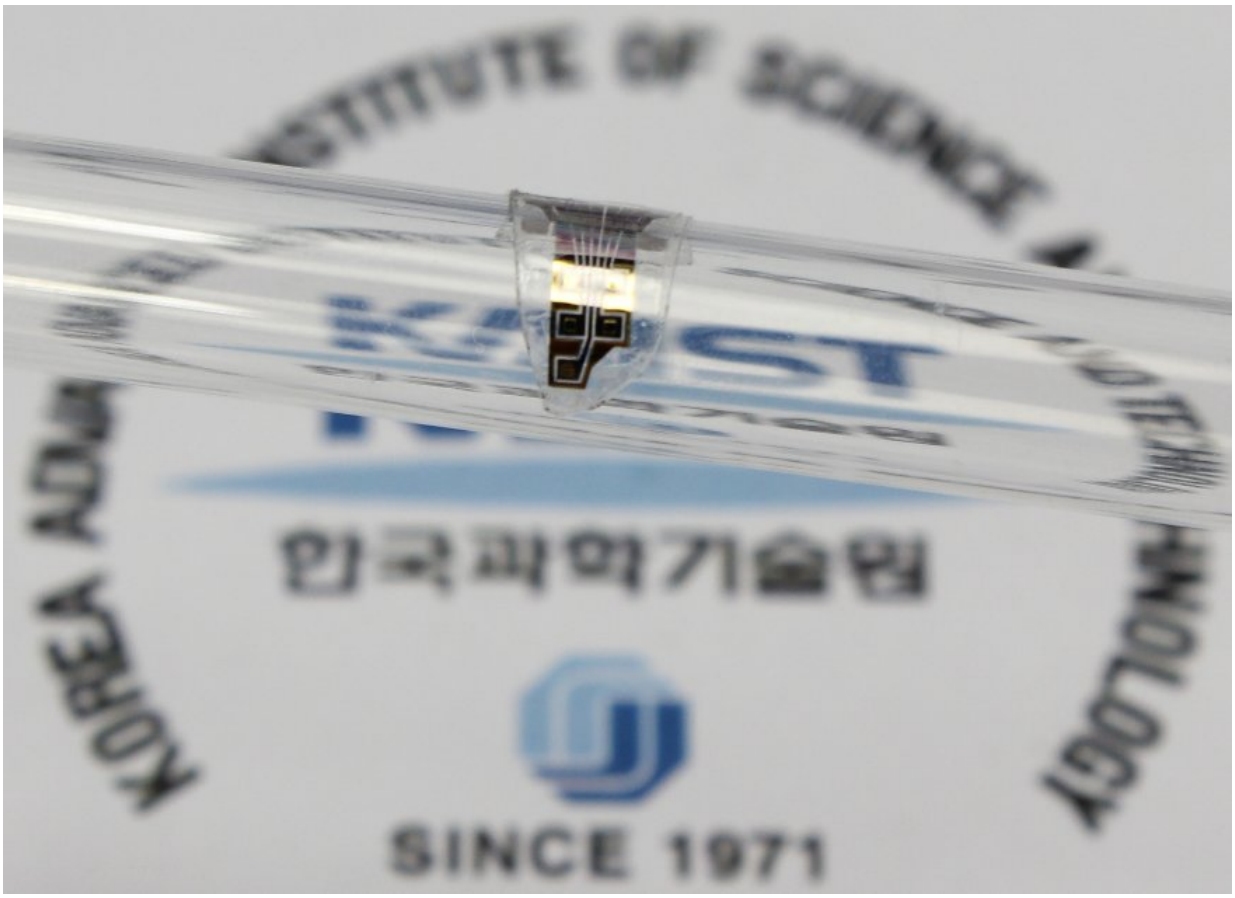


The flexible drug delivery device for controlled release fabricated via inorganic laser lift off. Credit: KAIST

A KAIST research team has developed a flexible drug delivery device with controlled release for personalized medicine, a step toward theragnosis.

Theragnosis, an emerging medical technology, is gaining attention as key factor to advance precision medicine with simultaneous diagnosis and therapeutics. Theragnosis devices including smart contact lenses and microneedle patches integrating physiological data sensors and drug delivery devices. The controlled drug delivery has fewer side effects, uniform therapeutic results, and minimal dosages compared to oral ingestion. Recently, some research groups conducted in-human applications of bulky, controlled-release microchips for osteoporosis treatment. However, they failed to demonstrate successful human-friendly flexible drug delivery systems for controlled release.

For this microdevice, the team under Professor Daesoo Kim from the Department of Biological Science and Professor Keon Jae Lee from the Department of Materials Science and Engineering, fabricated a device on a rigid substrate and transferred a 50 μm-thick active drug delivery layer to the flexible substrate via inorganic laser lift off. The device shows mechanical flexibility with the capability of precise administration of exact dosages at desired times. The core technology is a freestanding gold capping layer directly on top of the micro-reservoir containing the drugs, previously regarded as impossible in conventional microfabrication.



The flexible drug delivery device for controlled release attached on a glass rod. Credit: KAIST

This flexible drug delivery system can be applied to smart contact lenses or the brain disease drug delivery implants. In addition, when powered wirelessly, it will represent a novel platform for personalized medicine.

In animal experiments, the team treated epilepsy by releasing anti-epileptic medication through the device. Professor Lee believes the flexible microdevice will further expand the applications of smart contact lenses, therapeutic treatments for brain disease, and subcutaneous implantations for daily healthcare.

This study "Flexible Wireless Powered Drug Delivery System for Targeted Administration on Cerebral Cortex" was published in the June issue of *Nano Energy*.

More information: Sang Hyun Sung et al, Flexible wireless powered drug delivery system for targeted administration on cerebral cortex, *Nano Energy* (2018). DOI: 10.1016/j.nanoen.2018.06.015