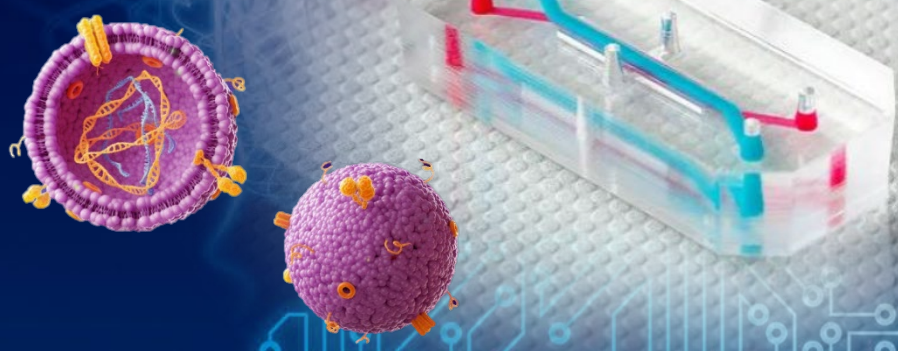
한림대학교

제 137회
ORGAN ON A CHIP
기술교류회

2026. 11. 19 목 오후 4시 30분

한림대학교 자연과학관 7103호





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1. Education

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2. Experience

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손상된 뇌 및 말초신경 기능 회복을 위한 신축성 -조직접착성 전자약 기술
Stretchable and Tissue-adhesive Electroceuticals for Effective Recovery of Brain and Peripheral Nerve Injuries

Tissue-like yet high-performance implantable bioelectronic systems capable of reliably recording electrophysiological signals in response to mechanical, optical, or electrical stimuli and delivering closed-loop feedback represent foundational technologies for next-generation neuroprostheses. Despite recent advances, their long-term stability remains constrained by material fatigue and electrical degradation. These challenges stem from the absence of a unified strategy that concurrently ensures robust tissue adhesion, intrinsic mechanical compliance, chronic electrical and mechanical reliability, biocompatibility, spatial uniformity, device-to-device reproducibility, and resistance to strain-induced artifacts. Overcoming these limitations demands an integrated approach combining advanced materials engineering, scalable manufacturing, and holistic system integration.

Herein, we first introduce a cortex-adhesive, shape-morphing ECoG sensor designed for stable neural recording, even during closed-loop transcranial ultrasound neuromodulation. The sensor integrates a catechol-conjugated alginate hydrogel adhesive, a stretchable 16-channel electrode array, and a viscoplastic, self-healing hydrogel–elastomer substrate, enabling robust fixation and conformal adherence to irregular cortical surfaces. Real-time detection of high-frequency oscillatory preseizure signals was successfully demonstrated, facilitating closed-loop seizure control in awake rodent models. Building upon this sensing capability, we further propose active organic electrochemical transistors (OECTs) utilizing an innovative, ultrathin, intrinsically stretchable hydrogel–elastomer adhesive bilayer. This transformative bilayer exhibits rapid rigid-to-soft transitions upon hydration, offering seamless conformal integration with soft tissue interfaces and superior ionic–electronic conduction properties. The OECT devices achieve strain-insensitive, high-performance biosignal transduction, enabling precise monitoring and modulation of neural activity.

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