Self-Assembled Origami Neural Probes

TECHNOLOGY NUMBER: 2023-119

OVERVIEW

Flexible, self-assembled origami neural probes for multifunctional, 3D neural interfaces

- Enhances electrode density, multifunctionality, and 3D recordings compared to conventional probes
- Potential applications in brain research, diagnostics, and interfacing for neural prosthetics

BACKGROUND

Neural probes have long been essential tools in neuroscience research due to their capability to record high-resolution neural activity. Traditional probes, often fabricated through monolithic approaches, face challenges in scaling up electrode counts and integrating multifunctional components. These conventional methods suffer from limitations like poor process compatibility, complex fabrication, and adhesion issues when integrating multiple layers of polymer and metal. Additionally, the formation of three-dimensional electrode arrays remains difficult, limiting the effectiveness of neural recording. As the demand for advanced neuroscience applications grows—ranging from chronic neural monitoring to various physiological parameter sensing—there is a pressing need for innovation in probe technology. Thus arises the necessity for a novel approach that can overcome these restrictions while expanding the functionality and recording capabilities, providing a robust tool for advanced neural interfacing.

INNOVATION

Researchers at the University of Michigan have developed self-assembled origami neural probes by leveraging magnetic and capillary forces for the assembly of planar and 3D structures. This technology allows separately fabricated flexible probes to self-align and laminate precisely, resulting in multifunctional and highly scalable probes. The probes are crafted with specialized fold lines, facilitating transformation into high-density, 3D shapes that significantly enhance recording capabilities. With up to 128 electrodes, integrated temperature sensors, and dopamine detectors, these probes are a versatile tool for neural recording, mapping neural circuits, and monitoring physiological changes within the brain. Their high customizability makes them suitable for tailored scientific and medical applications, including chronic brain studies, optogenetic research, and neural prosthetics, offering unprecedented capabilities to explore and intervene in neural systems.

ADDITIONAL INFORMATION

INTELLECTUAL PROPERTY: Patents Pending

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Category

Medical Devices
Life Sciences
Semiconductors, MEMS, and Electronics

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