INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Flexible, Miniaturized Neural Probe Coated with Biodegradable Polymer as Insertion Guide

TECHNOLOGY NUMBER: 5054

OVERVIEW

Fish-bone-shaped polyimide neural probe for chronic neural recording

- Reduces immune response and tissue damage with biodegradable coating
- Chronic neural recording, long-term brain-machine interfaces, deep brain stimulation

BACKGROUND

Chronic neural recording faces challenges due to immune responses degrading recording quality over time. Traditional probes often damage surrounding neurons, and immune responses cause glial scar formation, insulating electrodes from neurons and reducing functionality. Historically, various materials like polyimide and metals (gold, platinum, iridium) have been evaluated for biocompatibility, with flexible polymers preferred over rigid silicon for brain implants. Geometry also influences tissue reactions, with smaller, more intricate designs showing reduced immune responses. These approaches, however, are limited by practical implantation concerns. The need persists for an improved method that minimizes tissue reactions while maintaining structural integrity during implantation, preserving recording quality over extended periods.

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Category
Medical Devices
Engineering & Physical Sciences
Semiconductor, MEMS, and Electronics

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INNOVATION

The innovative fish-bone-shaped polyimide neural probe minimizes tissue reactions through a unique design and biodegradable silk coating. The probe features a flexible substrate, small dimensions, large separation distances between electrodes and the shank, and large openings in the substrate. These design elements enhance biocompatibility and reduce immune responses. The silk polymer coating provides temporary mechanical strength during insertion, then biodegrades within 30 minutes to 25 hours, optimizing probe structure independently of implantation constraints. This probe can be used in applications such as chronic neural recording, brain-machine interfaces, and deep brain stimulation, promising greater longevity and functionality by preventing the formation of insulating scar tissue around the electrodes.

ADDITIONAL INFORMATION

REFERNECES

"A flexible fish-bone-shaped neural probe strengthened by biodegradable silk coating for enhanced biocompatibility"

INTELLECTUAL PROPERTY

US9427164 "Insertable neural probe with flexible structure"