Micro implantable neural interface with electrophysiological and fluid delivery capability

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BRIEF DESCRIPTION

Researchers at UCI have developed a novel way to make microelectrodes and integrate the fluidic channels. In addition to delivering drugs and growth factors, a neural probe with fluidic and electrical capabilities was developed to further extend the longevity of neural electrodes by reducing the tissue/electrode mechanical mismatch of traditional neural electrodes. In addition to extending the life of probe, it is a biocompatablie insulator with the potential for MRI and other imaging compatibility.

FULL DESCRIPTION

Neural implants have emerged over the last few decades as a possible means to interact directly with our nervous system. By bridging the gap between our nervous system and the external environment, a neural implant system can potentially replace neural functions and treat neural disorders. Electrodes are one of the key components of neural implant systems that allow the electrical stimulation and recoding of activity of our neurons.

The advancement of Micro-Electro Mechanical Systems (MEMS) has made the realization of microelectrodes possible. The key advantages of using MEMS fabricated electrodes over traditional metal wire electrodes are batch fabrication, improved reproducible geometry and electrical characteristics, smaller feature size, and the capabilities for on-chip circuitry. The first integrated circuit compatible electrode was made at Stanford and demonstrated capabilities to measure neural activity from a rat's cortex.

Although microelectrodes have demonstrated success, their short lifespans are a barrier to clinical practicality. Microelectrodes typically last less than a year due cellular responses upon implantation. Within the last decade there have been efforts to include fluidic channels in electrodes. The incorporation of fluidic channels would not only allow for simulation electrophysiological measurements but also the capability to delivery drugs that enhance nerve regeneration and prevent reactive cellular response.

Fluidic channels were fabricated traditionally using a bonding technique which causes low adhesion strength and poor alignment. Fluidic channels fabricated using sacrificial layers and dielectric sealing methods are limited by their dimensions. Another critical drawback of traditional wire electrodes used in deep brain stimulation is that they are not MRI compatible.

Researchers at UCI have developed a novel way to make the electrodes and integrate the fluidic channels. In addition to delivering drugs and growth factors, a neural probe with fluidic and electrical capabilities was developed to further extend the longevity of neural electrodes by reducing the tissue/electrode mechanical mismatch of traditional neural electrodes. In addition to extending the life of probe, it is a biocompatablie insulator with the potential for MRI and other imaging compatibility.

SUGGESTED USES

Reading physiological signals within a body; restoring neural function; use with MRIs; implant for vision prosthesis; motor prosthesis, and deep brain stimulation; research/diagnostic/clinical uses; neural penetrating device with drug and fluid capability in medical field; neural stimulation/sensing; monitor electrical activity; test platform for toxicological studies, drug screening, and cell-based biosensors.

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OTHER INFORMATION

KEYWORDS

Microelectrode, Neurostimulation, Functional Electrical Stimulation, Brain Computer Interface, Brain Machine Interface, Deep Brain Stimulation, Cochlear Implant, Visual Implant, Neuroenhancement, Neuroengineering, Neural Interface, Neural Probe, Motor Pro

CATEGORIZED AS

- **Materials & Chemicals**
  - Chemicals
  - Composites
  - Electronics Packaging
  - Thin Films

ADVANTAGES

Less expensive, simpler to make, MRI compatible, more easily customizable and scalable.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,064,565	09/04/2018	2013-809

RELATED CASES

2013-809-0

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