Improved Neuron Electrode Array Uses Graphene

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WARF: P140254US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a transparent, flexible electrocorticography device for recording neural signals generated in brain tissue.

Overview

During electrocorticography (ECoG), electrodes are placed directly on the exposed surface of the brain or spinal cord to record electrical signals. The practice is used to conduct neuroscience research and treat patients afflicted with a variety of neuronal disorders. Small, micro-ECoG devices are especially attractive because they strike a balance between invasiveness and signal quality.

However, these devices employ opaque conductive materials that make it impossible to stimulate or image the underlying tissue. Transparent arrays have been fabricated using indium-tin oxide, but this material is brittle, requires high temperature processing and is limited in the ultraviolet (UV) and infrared (IR) wavelength ranges often used in neural imaging and optogenetic applications.

The Invention

UW–Madison researchers have designed a new micro-ECoG device that is flexible and transparent over a broad spectrum. The device includes an implantable electrode array made of conductive graphene sheets on a biocompatible substrate.

Both the substrate and the graphene sheets are transparent over a broad range of wavelengths in the UV, IR and visible spectrum. This allows light to be passed through the array and the underlying tissue for imaging purposes or optical stimulation.

The device is called CLEAR (Carbon Layered Electrode Array).

Applications

- Neural electrode arrays for clinical and research usage
- Optogenetics and imaging
- Cardiac, peripheral nerve, intramuscular and instrumented contact lenses for optical/biological fluid monitoring

Key Benefits

- CLEAR device is flexible and highly transparent (300 to 2000 nm wavelength range).
- Expands the potential of this technology
- Graphene is cheaper, abundant and easier to process.
- Ideal replacement for indium-tin oxide

Stage of Development

Prototypes have been tested in animal models.

Additional Information

For More Information About the Inventors

- Zhenqiang Ma
- Justin Williams

Related Technologies

- WARF reference number P04169US describes an implantable microsystem for neural recording, stimulation, and delivery of chemical or biological substances.
- WARF reference number P04202US describes a neural probe array designed for reliable and stable long-term implant function.

Tech Fields

- Medical Devices : Neurological devices

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846