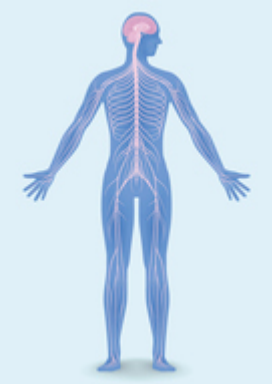
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Carbon Fiber in Silicone Nerve Interface Array

TECHNOLOGY NUMBER: 2018-373



OVERVIEW

Carbon fiber probe array for peripheral nerve recordings and stimulation

- Customizable design
- Minimally damaging surgical implantation technique

BACKGROUND

Devices that interact with the peripheral nervous system (PNS) are designed to either monitor or modulate neural activity in the peripheral nerves. These devices have various applications in medicine, neuroscience research, and bioengineering. Application of these devices range from control of robotic prostheses in cases of amputation to stimulation of autonomic nerves to regulate bladder control in cases of spinal cord injury. Current conventional nerve interfaces consist of silicone shanks that penetrate the nerve and cause considerable damage or cuff electrodes that wrap around the outside, causing less damage but also recording less discrete nerve signals. Recent work in the field has shown that recording inside the nerve produces the best signal, and that smaller electrodes produce less damage. There is a pressing need to create long lasting, minimally damaging devices that interface with the peripheral nervous system.

INNOVATION

Researchers have invented a carbon fiber technology that improves peripheral nerve recording and stimulation. The device consists of carbon fibers embedded within and extending beyond a

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Hardware
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piece of silicone guard. The silicone backing increases the already known flexibility of carbon fibers to the point where the fibers can withstand a 90 degree bend at the interface junction with the silicone. Each carbon fiber protrudes from the silicone by roughly 100um-500um in equally spaced increments. This innovation allows the ability of the approach to be expanded to large scale arrays with many fibers. In addition, carbon fiber length can be varied to evaluate nerves of different diameters, with an insertion technique that creates minimal handling damage to the nerve during surgery. This new carbon fiber technology, in combination with surgical implantation technique, allows for minimally invasive monitoring and stimulation of peripheral nerves.

PATENT APPLICATION

Number: 17/254,786

References

1. Jiman AA, Ratze DC, Welle EJ, et al. , Multi-channel intraneural vagus nerve recordings with a novel high-density carbon fiber microelectrode array. Sci Rep 10, 15501 (2020). https://doi.org/10.1038/s41598-020-72512-7