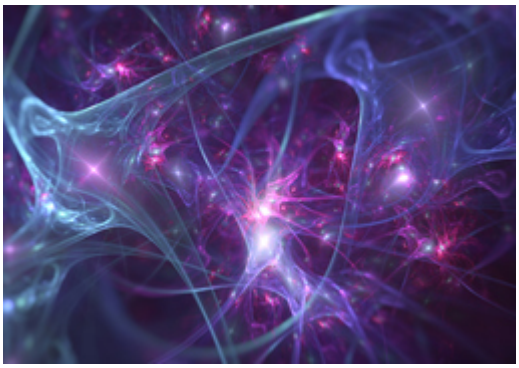
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Blue-PARAGONS: ¬µILED Integrated Modular Flexible Optoelectrode

TECHNOLOGY NUMBER: 2022-271



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Hardware
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Inventor
Euisik Yoon
Eunah Ko

Further information
Joohee Kim
jooheek@umich.edu

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OVERVIEW

An ultra-flexible optogenetic neural probe that evaluates neuronal circuitry and brain functions

- Light-emitting diodes encapsulated in a polyimide shank to protect brain tissue and probe
- Stimulates target cells containing light-responsive proteins to provide a light-delivery structure

BACKGROUND

Micro-sized light-emitting diodes (µILEDs) are a type of flexible and modular optoelectronic platform that can be used for a wide range of applications, including biomedicine, sensing, and communications. The µILED platform utilizes a combination of thin-film materials and microfabrication techniques to create highly flexible and modular devices that can be customized for specific applications. Inorganic LED (ILED) integrated optogenetic-based selective cell protein stimulation is a promising technology for evaluating neuronal circuitry and functioning. However, the approach cannot investigate the long-term chronic functionality, which is necessary to accurately construe and portray the neuronal circuitry. So, a need exists for continued improvements to the technology that make it smaller, unlikely to create normal tissue injury, capable of artificially controlling cell activity, and able to survive over a longer term inside the brain region of interest.

INNOVATION

Researchers have created an ultra-flexible optogenetic neural probe that provides improved evaluation of complex neuronal circuitry and its functions in the brain. This blue-light-emitting polyimide-based artificial apparatus for genetically modified opsin in neuron stimulation (B:PAR) uses micro-sized light-emitting diodes (µILEDs) to provide high resolution stimulation. The

μILEDs and recording probes are encapsulated inside a polyimide shank to protect both brain tissue and the probe. The method involves stimulating target cells which contain light-responsive proteins and includes providing an elongated light-delivery structure in a narrow passageway. The invention also includes activating less than all the light sources to deliver light to light-responsive proteins adjacent to the activated light sources along the length of the elongated light-delivery structure, thereby stimulating target cells in vivo. This invention may prove useful to improve research directed toward the diagnosis and treatment of brain disorders.