Universität Basel

Research Project

Nano Engineered Neural Interfaces - NENI

Third-party funded project

Project title Nano Engineered Neural Interfaces - NENI
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Project start 01.07.2019
Probable end 30.06.2021
Status Completed

Alzheimer's disease (AD) is an irreversible, progressive neurodegenerative disease that slowly destroys memory and thinking skills eventually leading to death from complete brain failure. It is the most common cause of dementia and affects more than 46 million people globally, with 500'000 new cases diagnosed annually in the United States alone. While there is still no cure for AD, there are several prescription drugs approved by the U.S. Food and Drug Administration to treat its symptoms. Recently, there has been growing excitement around treating neurological diseases using neuromodulation techniques. Flickering strobe lights at gamma-frequency of 40ăHz have shown very promising results in mouse models where microglia immune cells could be activated and contributed to degradation of amyloid-β proteins. Invasive neuromodulation methods can target very specific areas in the brain. The current modulation devices, however, are comparable to that of early cardiac pacemakers, leading to fibrotic encapsulation within weeks. This is mainly predicated on the neural probe's mechanical properties, given by the hard platinum/iridium electrodes from the semiconductor industry. Our proposed approach for ten thousand times softer electrodes is based on nano engineered neural interfaces (NENI) - hybrid microstructured polymer pads covered by ultra-thin and soft nanostructured metal/elastomer compounds. Our NENI probes will allow a rapid reconfiguration to pre-selected brain targets for a patient-specific anatomy and therefore enable the activation of microglia immune cells.

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This project is in collaboration with 5 project partners from around Switzerland: University Hospital Basel, Empa, PSI, FHNW, and University of Basel. In addition, two companies: Invibio Ltd/United Kingdom, a leading provider of polymeric biomaterials which have been used in around 9 million PEEK medical implants with more than 15 years of proven clinical history and Valtronic SA, a global contract manufacturer for the electronics of medical devices, are supporting this project.

Keywords Compliant neural interfaces, conductive elastomers, PEEK films, thermal nanoimprint lithography, brain and spinal cord modulation, nanometer-thin silicone gold composite
Financed by
Foundations and Associations

Add publication

Add documents

Specify cooperation partners