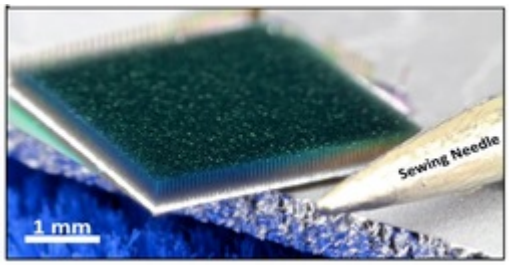
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Sea of Electrode Arrays (SEA): Scalable Three-Dimensional High-Density High-Aspect-Ratio High-Electrode-count Micro-Probe Array

TECHNOLOGY NUMBER: 2018-432



OVERVIEW

Method for fabricating a microprobe electrode array for neural stimulation and data recording

- 3D design with more than 400 electrodes/mm2 electrode density
- Customizable array configuration

BACKGROUND

Neurological studies rely on the ability to probe down to individual neurons in the brain and accurate measuring of their activity, which leads to a better understanding of natural and patho-physiological functions. Highly sophisticated electrode arrays have been developed to provide high spatial resolution of neural activity and consist of tightly packed, individual needles to probe brain tissue. Modern arrays often incorporate flexible or biocompatible materials that facilitate more prolonged and stable integration with brain tissue, paving the way for chronic neural recording with minimal adverse effects. Still, a need exists for improvements in this technology to optimize its potential.

INNOVATION

Presented is a method for fabricating a microprobe electrode array for neural stimulation and data recording. The developed apparatus consists of a 3D design with more than 400 electrodes/mm2 electrode density. By using deep reactive-ion etching (DRIE) to form high-aspect ratio holes in silicone, filled with metal-tipped needles, a sea-of electrodes array (SEA) is formed. The individual needles are measured at the following parameters: 1 mm long, 10-20 µm wide at base, and <1µm at the tip. This DRIE approach allows for variability in size and configuration by controlling different length, pitch, and diameter of needles. This configurable

Technology ID

2018-432

Category

Hardware
Engineering & Physical Sciences
Semiconductors, MEMS, and Electronics

Inventor

Daniel Egert
Khalil Najafi
Seyed Amin Sandoughsaz Zardini

Further information

Joohee Kim
jooheek@umich.edu

View online

approach allows high spatiotemporal resolution to probing neurons in different brain regions, which consists of various convoluted surfaces. Additional application includes microfluidic needle modifications for chemical and drug delivery.

PATENT APPLICATION

Number:16/449,012