Carbon-MEMS Based Multi-Sides Electrode Array Fabric for Neural Sensing and Recording

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We present a novel bio-compatible carbon-based array of high aspect-ratio microelectrodes on a flexible substrate for applications in neural sensing and simulations. The microelectrodes are made of pyrolyzed carbon derived from polymer pre-cursor supported by a flexible polyimide substrate and are intended for both implantable as well as wearable applications. The 3-dimensional aspect of the electrodes offer a significantly higher area of interaction with nerve cells as compared to traditional 2D metal electrodes resulting in higher signal-to-noise ratio. The neural pad presented here will sense signals from the motor cortex and then relay those signals to a small integrated circuit (IC) for processing. The IC then wirelessly communicates with a prosthetic limb in a closed signal loop that allows patient control over the limb. The microelectrode neural pad consists of a flexible 1-2 cm substrate with as many as 50 conductive microelectrodes. In this paper, we will present initial characterization results as well as preliminary in-vitro data for this implantable and self-contained ECoG recording and stimulation system based on 'electrode-array fabric' that allows long-term, high-resolution recording/stimulation at the surface of the brain.