Invited talk

Flexible silicon carbide electronics for long-lived bio-implantable recording and sensing applications

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Abstract

Implantable electronics are of great interest owing to their capability for real-time and continuous cellular-electrical-activity recording.[1] Nevertheless, since such systems involve direct interfaces with surrounding biofluidic environments, maintaining their long-term sustainable operation, without leakage currents or corrosion, is a daunting challenge.[2]

In this talk, we present a new bio-integrated bioelectronics systems based on cubic silicon carbide nanomembranes grown on silicon wafers,[3] released and then physically transferred to a flexible substrate.[4] Our findings demonstrate that flexible platforms based on nanomembranes of SiC offer many attractive features as long-lived implantable devices owing to its chemical stability in biofluids, outstanding water barrier characteristics and extremely low permeability to ions, suitable for stable operation with projected lifetimes of many decades in biological environments. The fabrication approach to release and transfer nanomembranes SiC onto flexible polymer substrates such as PI establishes a route to systems well suited for integration with soft tissues, enabling the development of unusual wide-band-gap semiconducting devices with bendable, foldable and flexible formats and advanced functional modes. The robustness of the SiC bio-interface along with its interesting physical properties including thermoresistive, piezoresistive effects suggest a promising path toward advanced versions of long-term implantable electronics for chronic neural and cardiac electrophysiology.

References:

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