Arizona State University

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Three-dimensional, polymer-based micro-electrode arrays for the central nervous system

AzTE Case # M00-044

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Invention Description

The promise of advanced neuroprosthetic systems to significantly improve the quality of life for many of the deaf, blind, or paralyzed population hinges on the development of effective, and safe, multi-channel neural interfaces for the central nervous system. In order to be successful, neural microelectrodes must have effectively long recording life, be insensitive to implant micromotion, have the ability to incorporate bioactive species onto electrode surface, and be easily positioned into the requisite implant area.

Researchers at Arizona State University have developed a thin-film polyimide-based, multi-channel intracortical interface which is manufactured with standard planar photo-lithographic CMOS-compatible techniques on 4" silicon wafers. The use of polyimide provides a mechanically flexible substrate which can be manipulated into unique three-dimensional designs providing strain relief against the forces of micromotion between tissue and implant. Polyimide also provides an ideal surface for the selective attachment of various important bioactive species onto the device in order to encourage favorable long-term reactions at the tissue-electrode interface.

Potential Applications

This technology lends itself to many applications including:

- **Cortical Prostheses for the blind**
- **Clinical Neuroprosthetics**
- **Basic Research Studies**

Benefits and Advantages

This neural interface offers many benefits:

- **Reliable** – Insensitive to micromotion
- **Longevity**– Device flexibility and bioactivity provide an optimal implant environment, extending the stability of tissue-electrode interface
- **Efficacy** – Capable of sensing multi-unit neural activity from the cerebral cortex
- **Diversity –** Polyimide allows a host of bioactive organic species to be adsorbed or covalently bonded to its surface.