Online Proceedings

POSTER SESSION 2

Balcony, Easel 97

1:00 PM to 2:30 PM

Pattern Recognition Alignment of Microneedles to Electrodes Using Nanoscribe Technology

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Mentor: Duane Irish, Washington Nanofabrication Facility
Mentor: Michael Khbeis, Washington Nanofabrication Facility

The Nanoscribe is a high-resolution (500nm) Nano 3D printer that is new to the Washington Nanofabrication Facility. It was acquired through a National Science Foundation (NSF) Major Research Instrumentation (MRI) grant. The tool uses a technology called two-photon polymerization. This involves the use of photoresist, which is a light sensitive material, and an infrared laser that directs brief pulses of light through a microscope objective in different patterns to create 3D objects. The highly focused laser beam allows for dimensions of less than 500 nanometers in X and Y directions to be achieved. One major limitation of the tool is that unlike most photolithography equipment, it is not programmed to do basic alignment. Most fabrication applications require at least two layers of materials to be aligned. For example, when making electronic circuits, there is a top and bottom layer at a minimum, and a vertical layer in between, thereby requiring at least two alignments to the first layer. Our research is focused on understanding and testing test code to add pattern recognition alignment capabilities to the Nanoscribe instrument. For our test application, we applied test aligning microneedles to pre-patterned electrodes fabricated using conventional photolithography. We then 3D printed microneedles that are subsequently used to release drug therapies in test wells via an applied electrical potential (voltage). The alignment process that we developed can be used as a basic construct and capability for other applications being developed on the tool.

POSTER SESSION 3

MGH 258, Easel 179

2:30 PM to 4:00 PM

Developing a Microfabrication Process for X-Ray Diffraction Gratings

Benjamin Bui Gaston, Senior, Mechanical Engineering: Mechatronics
Angelo Quinn Wai (Angelo) Ong, Senior, Microbiology
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X-ray diffraction gratings are an array of equally spaced structures with defined width designed to diffract optical waves. These waves create a spectrum that allows for the characterization of the wavelength or angles created by each diffraction. X-ray diffraction is commonly used in x-ray crystallography, where x-rays are diffracted off crystal lattices and give information about its three-dimensional structure. The goal of this project is to develop a microfabrication process for high aspect ratio x-ray diffraction gratings. These devices will expand the x-ray diffraction capabilities of the University of Washington and the National Nanotechnology Coordinated Infrastructure (NNCI) at large. In developing this process, our main objectives are to attain smooth vertical sidewalls for the grating features, minimize gold waste in the plating process and to be highly repeatable. For our research, each fabrication step will be tested, troubleshot, and documented for future use. The microfabrication steps required in our process include photolithography, etching, grinding and polishing, wafer bonding, and electrochemistry metal plating. The main challenges of this project are producing a photoresist pattern thick enough to withstand deep etching without affecting the sidewall profile, attaining precise grinding thicknesses and overcoming wafer bonding complications. The work towards maturing each process through inspection and troubleshooting for fabricating high aspect ratio x-ray gratings will be discussed.