Abstract for 6th Annual FIB SEM Workshop

Title: Advances in Ion Beam micromachining for complex 3D microfluidics

Author: Leonidas E Ocola, Argonne National Laboratory, Argonne IL 60439

The focused ion beam / scanning electron microscope (FIB/SEM) is a powerful tool used for sample analysis and characterization. When equipped with a sophisticated pattern generator and lithography technology it can expand its use to new applications in nano- and micro-fabrication. Ion beam micromachining is akin to electron beam lithography, where the beam of charged particles are steered to draw structures contained in a computer aid design (CAD) file. Unlike electron beam lithography, one can program arbitrary depths by manipulating the dwell time, or dose, of a particular structure. We have been working on this topic for several years now and are able to show that the ion beam tool can be used for real microfluidic applications where the bottom of serpentine mixers are texturized dramatically using the FIB/SEM. Some of the lessons learned and pros and cons of different patterning strategies will be presented.

An example of our capabilities is shown in Fig 1, where the bottom of a focusing mixer, previously fabricated with standard lithography and etching, is then further modified by milling away strips to create a graduated and continuously changing profile.

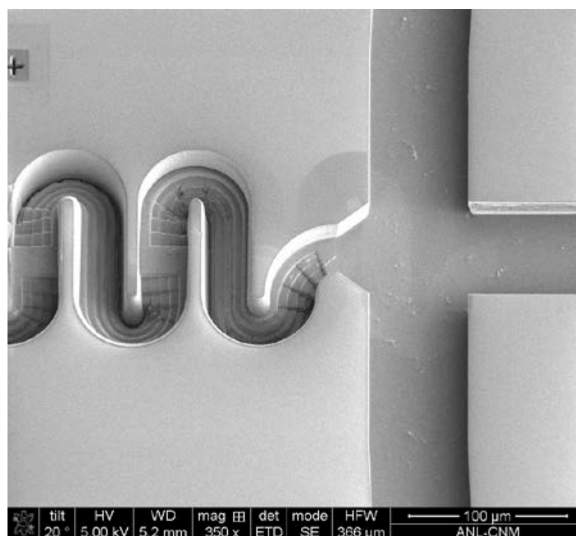

Figure 1. Example of a focusing microfluidic mixer with an ion beam micromachined texturized bottom using an FIB SEM.

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