Name: Sunita Venkatesh
SID: 21742836
Research Focus: MEMS
Faculty: Liwei Lin
Mentor: Ryan Sochol
Topic: 3-D Printed Integrated Microfluidic Circuitry
Post it? Sure

Autonomous fluidic components are critical to the advancement of integrated micro/nanofluidic circuitry for lab-on-a-chip applications. The standard method of fabrication for these devices involve the soft lithography process which demands extreme precision and is constrained by the 2-D masking process. A novel way to fabricate microfluidic structures and self-regulating microfluidic circuitry components is to use 3D printing. 3D printing has evolved to have resolutions better than 20 microns and can quickly and accurately fabricate a desired device. 3D printing also allows devices to have 3-dimensional features including springs, balls and hinges. This semester, the primary point of investigation was characterizing the ProJet 3D printer in the Sutardja Dai Invention Lab and beginning to fabricate integrated microfluidic components.

The most common microfluidic circuitry component is the diode. It allows fluid to travel in only one direction. We created several designs for fluidic diodes in SolidWorks before 3D printing them. Over the past semester, an optimal design was chosen. Figure [1] shows the spring diode, which pushes outward when fluid travels right through the channel but closes the channel when fluid travels the other direction. The spokes on the outside edge of the channel are guides to keep the spring head from falling too far from the channel entry point.

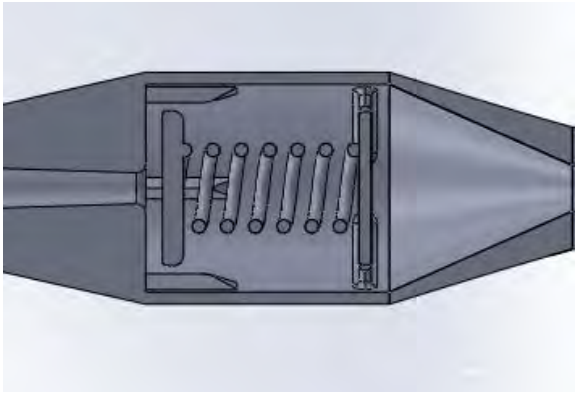
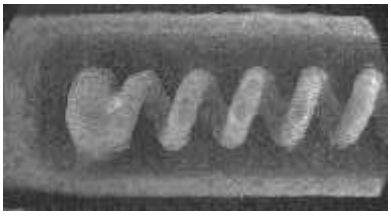


Figure [1]: Cross section of spring diode

Initial printer results have been good. We have been achieving good resolution on pipe channels as well as 3-dimensional features. Figure [2] shows an actual print of a spring diode under the SEM.



Figure[2]: 3D printed Spring Diode in SEM