MSE SEMINAR

April 20, 2017
113 McBryde Hall
3:30 – 4:30 PM
Refreshments at 3:00 PM

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"3D Printed Acoustofluidic Devices for Droplet- and Microfluidic-based Cell Separation Applications"

ABSTRACT

Three-dimensional (3D) printing now enables the fabrication of novel 3D and structural electronics. Here, we demonstrate the ability to fabricate microelectromechanical systems (MEMS) that contain robotically embedded ceramic-based electronic components and encapsulated microchannels using 3D printing. Acoustofluidic devices were printed using a pick-and-place microextrusion 3D printing system. Electrical impedance spectroscopy and finite element modeling studies showed the printed acoustofluidic devices exhibit multiple resonant modes of varying mode shape over the 0 – 20 MHz frequency range. Flow visualization studies revealed the printed devices exhibit bulk acoustic waves (BAWs) that size-selectively trap, mix, and separate suspended particles. Frequency- and particle size-dependent regimes of acoustic particle trapping and/or streaming were observed in fluid droplets and in continuous flow within a microchannel. These separation and isolation techniques can be utilized to achieve 3D spatial control of cells in both droplet-based and microfluidic-based biosensors, separators, and other biodevices.

BIOSKETCH

Ellen Cesewski is a PhD student in Dr. Blake Johnson's Advanced Biomanufacturing and Biosensing Laboratory, which is part of the interdisciplinary Advanced Manufacturing Team at Virginia Tech. She graduated from University of Maryland with a Bachelor's of Science in Materials Science and Engineering in 2015. Her research leverages multi-material 3D printing processes toward the development of novel technologies including biosensors and biomedical devices to enable sensitive, selective, real-time detection of biologics in complex matrices, better understand the parameters that govern physiology and pathophysiology, and characterize the dynamics of cell cultures and tissues. Her projects involve bioconjugation chemistries, surface/interfacial chemistry, surface functionalization, acoustofluidics, transport phenomena in biological systems, bioreactor design, and process control.