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Abstract for an Invited Paper
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**Acoustic Microfluidics for Bioanalytical Application**[1]

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This talk will present new methods the use of ultrasonic standing waves in microfluidic systems to manipulate microparticles for the purpose of bioassays and bioseparations. We have recently developed multi-node acoustic focusing flow cells that can position particles into many parallel flow streams and have demonstrated the potential of such flow cells in the development of high throughput, parallel flow cytometers. These experiments show the potential for the creation of high throughput flow cytometers in applications requiring high flow rates and rapid detection of rare cells. This talk will also present the development of elastomeric capture microparticles and their use in acoustophoretic separations. We have developed simple methods to form elastomeric particles that are surface functionalized with biomolecular recognition reagents. These compressible particles exhibit negative acoustic contrast in ultrasound when suspended in aqueous media, blood serum or diluted blood. These particles can be continuously separated from cells by flowing them through a microfluidic device that uses an ultrasonic standing wave to align the blood cells, which exhibit positive acoustic contrast, at a node in the acoustic pressure distribution while aligning the negative acoustic contrast elastomeric particles at the antinodes. Laminar flow of the separated particles to downstream collection ports allows for collection of the separated negative contrast particles and cells. Separated elastomeric particles were analyzed via flow cytometry to demonstrate nanomolar detection for prostate specific antigen in aqueous buffer and picomolar detection for IgG in plasma and diluted blood samples. This approach has potential applications in the development of rapid assays that detect the presence of low concentrations of biomarkers (including biomolecules and cells) in a number of biological sample types.

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