Microfluidic System for Particle Trapping and Separation

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BRIEF DESCRIPTION

Researchers have developed a novel system and method to rapidly separate particles from liquid. This technology demonstrates lab-on-a-chip potential for particle separation and/or purification. This technology is capable of processing a wide variety of molecules, ranging from cells to smaller biomolecules such as proteins and nucleic acid. Applications of this technology include (but are not limited) use of it for particle separation and quantification for assays, cell preparation, and cell lysing and component separation.

FULL DESCRIPTION

Diagnostic testing is an essential component of healthcare. In efforts to expedite diagnosis, and subsequently treatment and containment, rapid diagnostic tests (RDTs) for point-of-care (POC) have been developed. However, current RDTs fail to reproduce results with the precision and accuracy of standard laboratory tests. These problems associated with POC tests stem from the passive nature of these tests. To maintain the simplicity associated with POC, many POC tests rely on capillary driven flow and have limited control over reagent or sample handling. Additional sample preparation such as separations and/or extractions would improve accuracy of POC tests. Current separation processes include centrifugation, precipitation, adsorption, and chromatography and rely on particle distinction by size, shape, density, and other physical and chemical properties. These methods can be costly, time-consuming, and require large volumes.

Here, researchers at UC Irvine have developed a microfluidic system for particle manipulation. This has direct applications in particle separation from liquid. This technology works by relies on acoustic energy (applied via an external piezoelectric transducer) to energize the gas liquid interface of the injected liquid sample to create microvortices. These microvortices gently remove and trap particles and debris from the liquid and adjacent surfaces. The trapping efficiency can be controlled by varying the voltage, frequency, burst mood, waveform applied to the external transducer.

Researchers have demonstrated use of this technology for rapid particle separation from liquid (plasma from blood), size-based particle separation, and two-step agglutination assays. Separations of particles allows for quantitative post-processing. Furthermore, researchers have also applied the ultrasonic energy to improve the efficacy of cleansers and solvents (such as proteins from soiled contact lenses). The technology has also been used to lyse blood cells and then separate the cellular debris.

SUGGESTED USES

This technology is applicable for fluid and particle manipulation. Researchers have demonstrated a wide range of applications ranging from basic particle-liquid separation to quantitative assay of analytes.

ADVANTAGES

The technology can be adapted to different types of particles of different sizes by merely changing the properties of the applied external transducer. It is amenable to conventional manufacturing processes, and can be used for sample manipulation of small volumes.

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OTHER INFORMATION

CATEGORIZED AS

- » **Medical**
  - » Devices
  - » Diagnostics
  - » Research Tools
  - » Screening
- » **Nanotechnology**
  - » Tools and Devices
- » **Sensors & Instrumentation**
  - » Biosensors
  - » Medical
  - » Scientific/Research

RELATED CASES

2012-663-2

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,564,147	02/18/2020	2012-663

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