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# Enhanced Cell/Bead Encapsulation Via Acoustic Focusing

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## CONTACT

Alvin Viray  
aviray@uci.edu  
tel: 949-824-3104.



## OTHER INFORMATION

### CATEGORIZED AS

- » **Agriculture & Animal Science**
  - » Animal Science
  - » Chemicals
  - » Devices
  - » Transgenics
- » **Biotechnology**
  - » Genomics
  - » Health
  - » Proteomics
- » **Medical**
  - » Disease: Kidneys and Genito-Urinary System
- » **Sensors & Instrumentation**
  - » Environmental Sensors

BRIEF DESCRIPTION

The invention consists of a multi-channel, droplet-generating microfluidic device with a strategically placed feature. The feature vibrates in order to counteract particle-trapping micro-vortices formed within the device. Counteracting these vortices allows for single particle encapsulation in the droplets formed by the device and thereby makes this technology a good candidate for use in single cell diagnostics and drug delivery systems.

RELATED CASES

2015-506-0

FULL DESCRIPTION

Devices that rely on the movement and manipulation of small quantities of fluids are known as microfluidic devices. These devices contain micro-channels that allow fluids flow through. Often, these devices also contain focusing regions for the manipulation of those fluids. A subclass of microfluidic devices, which are configured to produce droplets of fluids, has the potential to be valuable to the advancement of targeted drug delivery systems and single cell diagnostics. Specifically, this subclass has the ability to encapsulate particles, such as single cells or therapeutic agents, in the generated fluid droplets. One drawback to using droplet generating microfluidic devices to encapsulate particles is that the particles of interest may become trapped in micro-vortices. These micro-vortices form in the flow-focusing regions of the device, preventing the particles from becoming encapsulated. Additionally, due to Poisson’s stochastic distribution, when particle encapsulations occur, they may occur as multi-particle encapsulations in a single droplet. This results in heterogeneity in the final product.

Researchers at UCI have invented a droplet generating microfluidic device that uses a strategically placed feature to create counter-vortices in the flow-focusing region of the device. The characteristics of the feature are tunable and easily controlled. Counteracting the micro-vortices results in fewer trapped particles and a higher number of particle encapsulations. The parameters of the feature can also be tuned to enhance the number of single particle encapsulations over existing methods (such as magnetic bead or cytometry-based approaches). These advantages make the technology a prime candidate for single cell diagnostics and applications where a homogeneous final product is vital (such as in drug delivery systems).

SUGGESTED USES

- Cellular diagnostics (such as rare cell identification)
- Drug delivery systems
- Environmental applications (water sample testing, etc.)

FEATURES/BENEFITS

- \*Higher encapsulation efficiency
- \*Higher homogeneity in the final product (makes this a possible technology for drug delivery where dosing must be uniform)

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,559,809	01/24/2023	2015-506

