Monodisperse Emulsions Templated By 3D-Structured Microparticles

Tech ID: 31974 / UC Case 2019-471-0

SUMMARY

UCLA Researchers in the Departments of Bioengineering and Mathematics have developed a method to generate uniform, thermodynamically stabilized microdroplets with digitizable solid structures.

BACKGROUND

In standard emulsions, mixtures of different types of liquids result in non-uniform and continually changing droplet volumes. These mixtures are unpredictable and are inconsistent, resulting in varying results. There is a need for a way to generate uniform, monodisperse microdrop emulsions in a single step without complex instrumentation, allowing for its content to be equally mixed and dispersed throughout.

INNOVATION

UCLA researchers have developed a method to generate uniform emulsions composed of small droplets formed through the action of mixing shaped microparticles with an oil and water solution. These droplets maintain a monodisperse state allowing for equal dispersion of its contents. This allows for these droplets to be easily contain uniform amounts of a desired material and creates a predictable and reliable systems for e.g. molecular or cellular analysis. In addition, due to the unique construction of these particles, the formation of an outer and inner layer allows for unique properties to be assigned depending on each layer's content. Each compartment is chemically-defined and can be sized to hold only a single particle or cell, allowing for digitized solid substrates that can be barcoded for single-cell analysis to store information from reactions or impart new physical properties.

APPLICATIONS

- Microscale drop-carrier particles
- "Lab-on-a-particle" technologies
- Single Molecule Analysis
- Small Droplet Laboratories
- Small Volume Devices

ADVANTAGES

- Creates uniform drops
- Thermodynamically stabilized microdroplets
- Interior and exterior can be chemically modified separately
- Digitized solid structure
- Easily applied to multiple sources

RELATED MATERIALS

- Chueh-Yu Wu, Bao Wang, Joseph de Rutte, Mengxing Ouyang, Alexis Joo, Matthew Jacobs, Kyung Ha, Andrea L. Bertozzi, Dino Di Carlo. Monodisperse drops templated by 3D-structured microparticles. bioRxiv 2020.03.22.001065; doi: https://doi.org/10.1101/2020.03.22.001065. - 03/25/2020
- C.-Y., Owsley, K. and Di Carlo, D. (2015), Rapid Software-Based Design and Optical Transient Liquid Molding of Microparticles. Adv. Mater., 27: 7970-7978. doi:10.1002/adma.201503308.

STATE OF DEVELOPMENT

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Drop-Carrier Particles, Small Molecule Analysis, Small molecule laboratories, Microfluidics, Liquid particles, Small Volume,

CATEGORIZED AS

- **Materials & Chemicals**
  - Other
- **Sensors & Instrumentation**
  - Other
- **Engineering**
  - Other

RELATED CASES

2019-471-0

Method has been successfully developed and tested.

PATENT STATUS

Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Integrated Isolation, Emulsification, And Single-Cell Assay
- Enhanced Fluorescence Readout And Reduced Inhibition For Nucleic Acid Amplification Tests
- Label-Free Digital Bright Field Analysis of DNA Amplification
- Microfluidic Platform to Control Particle Placement and Spacing in Channel Flow
- Robust, Ultra-Flexible, Micro-Encoded Ferromagnetic Tape for Bioseparation and Assembly
- Controllable Emulsification and Point-Of-Care Assays Driven by Magnetic Induced Movement of the Fluid

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