Multiple Nanoemulsions and Complex Nanoparticles for Encapsulation and Release

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BACKGROUND

While many techniques exist to create multiple emulsions (droplets in droplets), they create large droplets that are limited in many ways. For example, multiple emulsion droplets are typically made one at a time and are accumulated at a very slow rate of about one milliliter per hour. Most techniques also require new equipment that prevents scaling down to the nanoscale. Furthermore, these techniques frequently produce unstable emulsions. Overcoming these challenges to create complex nanoscale particles would show great promise in fields such as pharmaceuticals, food, agriculture, and consumer products.

DESCRIPTION

Researchers at the University of California, Santa Barbara have created stabile multinanoemulsions using sequential high-energy emulsification which can be used as a final product or to make nanoparticles. The emulsification is achieved using standard, scalable equipment (e.g. homogenization). It can be used to produce both oil-in-water-in-oil (O/W/O) or water-in-oil-in-water (W/O/W) double nanoemulsions, and is compatible with both organic and nonorganic materials, including natural products and generally regarded as safe (GRAS) components. For example, one can put water droplets in fat oils to create low-calorie food emulsions. Alternatively, the emulsions can be used to create “nanojellies” with a polysaccharide matrix and encapsulated oil nanodroplets for water-dispersable oil formulations. The emulsion process can be used to create colloidally-stable, nano-sized particles making applicable to pharmaceuticals and agriculture. Additionally, the emulsion process can be used to release an encapsulated ingredient or particle, which can be controlled by adjusting the size and number of inner droplets. Furthermore, this process allows for the stabilization and separation of drugs or chemicals that share the same space.

ADVANTAGES

- High encapsulation efficiency and droplet stability
- Can be used to produce large quantities of particles
- Simultaneous encapsulation/stabilization of polar and nonpolar drugs/chemicals
- Stabilization of drugs/chemicals
- Nanoscale particles (diameters as small as 100-200 nm)
- Compatible with natural products and GRAS compounds

APPLICATIONS

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OTHER INFORMATION

KEYWORDS

multinanoemulsions, emulsification, indadvmat, nanoparticle

CATEGORIZED AS

- **Nanotechnology**
  - Other

RELATED CASES

2017-473-0

- Consumer products (e.g. fragrances, topical cosmetics, cleaning products)
- Agriculture
- Pharmaceuticals
- Paints and coatings
- Nanoparticle synthesis
- Food products

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,254,773	02/22/2022	2017-473
Patent Cooperation Treaty	Published Application	WO 2018/209293	04/04/2019	2017-473

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Phosgene-Free Synthesis of an Isocyanate-Containing Boron-Dipyrromethene Fluorescent Probe, Which Allows Direct Fluorescent Labeling of Nucleophilic Sites on Substrates
- Polymer-Drug Conjugates for the Co-delivery of Synergistic Chemotherapy Drugs

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