Massively Parallel Assembly of Composite Structures using Depletion Attractions

Tech ID: 20258 / UC Case 2007-405-0

SUMMARY

Scientists in the Department of Chemistry and Biochemistry at UCLA have identified a way to selectively order and assemble solid microcomponents dispersed in liquids into larger composite devices using attractive interactions that are geometry-dependent. This technique enables the systematic parallel fabrication of complex microstructures from designed microscale and nanoscale parts by directing self-assembly of those parts.

BACKGROUND

In the race for achieving miniaturization of useful machines and devices to the microscale and nanoscale, it would be useful to have a means of connecting components to build devices. One-off production of assemblies of components might be made using laser tweezers or microfluidics, yet it would be highly desirable to assemble millions or billions of copies of the same multicomponent device in solution in parallel at the same time. Heretofore, such massively parallel off-chip assembly processes have been only poorly controlled because the interactions have not been strongly dependent on the nature of the geometry and shape of the components.

INNOVATION

Researchers at UCLA have developed a method to construct complex microstructures via mass fabrication techniques employing depletion attractions that depend on the shapes of particulate components. From a solution containing a mixture of particles with similar or different shapes, this method induces aggregation of targeted particles into larger structures. The method can induce aggregation of particles with similar shapes into ordered structures as well as binding particles of different shapes into pre-determined configurations. This facilitates the fabrication of multiparticle structures for applications in drug delivery and microscale assembly.

APPLICATIONS

- Particle separation and drug delivery for nanotechnology applications
- Massively parallel off-chip assembly of MEMS and other microstructures
- Mass production of active microscale delivery devices for drug delivery applications

ADVANTAGES

- Provides very specific targeting of particle interactions based on the particle shape
- Enables multiple-step fabrication schemes of microstructures
- Allows composite microstructures to be fabricated

RELATED MATERIALS


PATENT STATUS

<table>
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<tr>
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<th>Type</th>
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<td>United States Of America</td>
<td>Issued Patent</td>
<td>9,051,176</td>
<td>06/09/2015</td>
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ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Litho-particle Dispersions: Designer Particles with Customizable Shapes
- Process For Creating Stable Double Emulsions
- Process For Directing Assemblies of Particulate Dispersions Using Surface Roughness
- Improved Treatment of Acute Metabolic Acidosis
- Measuring Size Distributions of Small-Scale Objects
- Method of Making Multicomponent Nanoemulsions
- Mechanical Process For Creating Particles Using Two Plates
- Process For Recycling Surfactant In Nanoemulsion Production
- Process For Sorting Dispersed Colloidal Structures

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OTHER INFORMATION

KEYWORDS

Biomedical, Drug Delivery, Materials, Process/Procedure, Microstructure Fabrication, Particle Interaction, MEMS, Nanotechnology, Nanomachines, Self-Assembly

RELATED CASES

2007-405-0