Process for Directing Assemblies of Particulate Dispersions Using Surface Roughness
Tech ID: 20410 / UC Case 2008-090-0

SUMMARY

UCLA scientists have discovered a new route for systematically designing and directing the assembly of custom-shaped particles by tailoring the surface roughness of custom-shaped microparticles.

BACKGROUND

One of the key frontiers in mass-producing three-dimensional devices at the microscale and nanoscale is being able to manipulate and assemble constituent components reliably and in parallel. Previous research has shown that shape-specific attractive interactions between solid particles that are dispersed in liquid solutions can be controlled to assemble differently shaped components into microscale and nanoscale components.

INNOVATION

Researchers at UCLA have studied dispersions of microscopic particles mixed with depletion agents and demonstrated that the strength of depletion attractions between the different surfaces of the particles can be tuned not only through shape control, but also through localized control of the surface roughness. This is another viable route for systematically designing and directing the assembly of custom-shaped particles by tailoring the surface roughness of custom-shaped microparticles dispersed in a liquid and varying the size of smaller nanoscale colloids relative to the roughness. Commercial applications include mass producing microscale devices made from several interlocking pieces, including microscale engines and pumps. In addition, particles can be aggregated and separated based on surface roughness to remove particles with very rough surfaces. Other applications include decorating surfaces with particles, depending on the roughness of the particles.

APPLICATIONS

- Fractionating and separating particles having different surface roughness
- Mass production of multi-component assemblies of particles in solution through control over roughness on their surfaces
- Assembling two or more microscale solid components in a desired configuration
- Mass production of microscale devices made from several interlocking pieces, including microscale engines and pumps.

ADVANTAGES

- Assemblies formed are identical with very low error rate
- Assemblies can contain moveable parts that are lubricated by a liquid layer
- Several stages of assembly can be made using different sizes of surface roughness and depletion agents to produce highly complex devices

STATE OF DEVELOPMENT

Separate particle components in solution have been controlled using surface roughness and depletion attractions to form millions of identical assemblies with very low error rate.

RELATED MATERIALS

[more]

PATENT STATUS

<table>
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<tr>
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<td>United States Of America</td>
<td>Issued Patent</td>
<td>8,193,102</td>
<td>06/05/2012</td>
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ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Improved Treatment of Acute Metabolic Acidosis
- Process For Creating Stable Double Emulsions
- Reacting Molecules and Colloids Electrophoretically
- Massively Parallel Assembly of Composite Structures using Depletion Attractions
Gateway to Innovation, Research and Entrepreneurship

- Litho-particle Dispersions: Designer Particles with Customizable Shapes
- Measuring Size Distributions of Small-Scale Objects
- Process For Recycling Surfactant In Nanoemulsion Production
- Process For Reducing Sizes Of Emulsion Droplets
- Method of Making Multicomponent Nanoemulsions
- Novel Multi-Scale Pre-Assembled Phases of Matter
- Ultrastable Nanoemulsions In Disordered And Ordered States
- Mechanical Process For Creating Particles Using Two Plates
- Process For Sorting Dispersed Colloidal Structures
- Shape-Controlled Particles Having Subparticle Geometrical Features