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Low Cost Nanoparticle Surface Customization using Magnetic Fields (2014-034)

Enhances Self-Assembly of Nanoparticles using Magnetic Gradients for Directed Surface

Market Overview

The combination of a weak salt solution and a large magnetic field gradient enhances self-assembly of nanoparticles and can create a customized nanoparticle surface pattern from colloidal solution. Nanoparticle detection is a $2.6 billion market that is growing at a 17 percent CAGR. Nanoparticles play a role in many different technology sectors outside of nanotechnology, including manufacturing, diagnostics/sensors, and optics. Currently, when creating nanoparticles, the possibility of runaway aggregation exists, causing the particles to grow too big for their intended use. This particle growth requires extensive sources to ensure particle size consistency. Clemson University Researchers have developed a nanoparticle modification that can accurately control nanoparticle size and surface pattern at a lower cost than traditional methods without the need for additional particle enhancement.

Application

Low cost manufacturing of optical coatings and materials

Stage of Development

Preliminary Prototype

Advantages

- Enhances self-assembly of nanoparticles, increasing the performance of field-directed surface patterning
- Eliminates the need for additional enhancement to ensure consistent particle size, providing a low cost method for high customization
- Trigger mechanism results in non-spontaneous assembly

Technical Summary

This technology enhances the self-assembly of nanoparticles in the presence of strong magnetic field gradients. By slightly modifying a colloid in solution with a weak salt "trigger," particles begin to selectively aggregate in the presence of a magnetic force which helps drive the particles together. This slight destabilization helps create a self-assembled material in a shorter amount of time and with better fidelity than if the salt solution is not added to the colloid. The trigger is too small to effect any change in the bulk suspension stability/properties, resulting in consistent particle size at a lower cost.

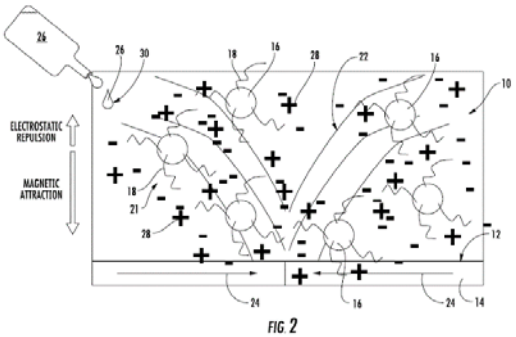

FIG. 2

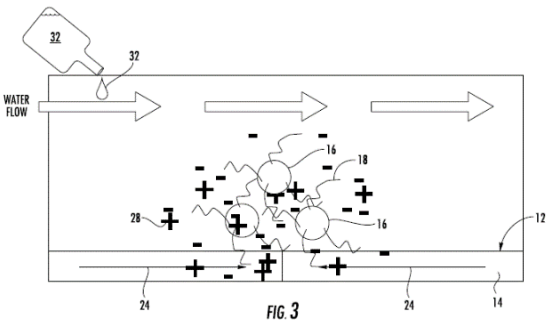

FIG. 3

For More Information Contact: Andy Bluvas | bluvasa@clemson.edu | (864) 656-5157 | CURF Reference No. 2014-034

App Type	Country	Serial No.	Patent No.	CURF Ref. Number	Inventors
Utility	United States	14/535,996	NA	2014-034	Olin Thompson Mefford, Yves Cordeau, Thomas Crawford, Longfei Ye, Tanner G. Pearson

About the Inventor

Dr. O. Thompson Mefford is an Associate Professor of Materials Science & Engineering at Clemson University. He earned his Ph.D. in Macromolecular Science and Engineering from the Virginia Polytechnic Institute and State University. Dr. Mefford has numerous publications in multiple academic journals, has received the Award of Distinction from the Clemson University National Scholars, the Clemson University college of engineering and Science Collaboration Award, and has secured a substantial amount of outside funding to promote his research. His main research areas include synthesis and modification of polymers and nanomaterials, magnetism, and environmental applications for his work.

For More Information

To learn more about this technology, please contact:

Andy Bluvas
Technology Commercialization Officer
bluvasa@clemson.edu
(864) 656-5157