

Ferroelectric Nanofluids for Piezoelectric and Electro-Optic Uses

Summary

Researchers at Vanderbilt University have developed a new method of producing microscale and nanoscale ferroelectric fluids. These particles are useful in a variety of piezoelectric, pyroelectric, and electrooptic devices such as thin-film capacitors, electronic transducers, actuators, high-k dielectrics, pyroelectric sensors, and optical memories.

Addressed Need

- » Scarcity of microscale and nanoscale ferroelectric materials
- » High mobility nanofluid without the need for direct pressure or large magnetic and/or electric fields

Technology Description

This innovative technology provides a method of producing ferroelectric nanofluids in any microscale or nanoscale size. The method of producing these particles uses quantum dots mixed with antimony salts to yield agglomerates of particles that exhibit extreme susceptibility to electric fields. These agglomerates can be reduced in size through various methods in order to obtain smaller agglomerates of ferroelectric particles. Mobility within an applied field is size-dependent, with smaller sizes demonstrating higher mobilities, allowing for manipulation of the nanofluid with minimal electric field (including static electricity from fingertips).

Unique Properties and Applications

- » Novel ferroelectric nanofluid with extreme sensitivity to static electric fields
- » Easy manipulation into fluorescent dyes with low electrostatic field
- » Post-fabrication insertion of ferroelectric nanofluid into machinery to prevent friction wear between surfaces. Can also be readily removed upon degradation
- » Can be stabilized into a thin film for ferroelectric tunneling junctions
- » Rapid response to electrostatic fields for Smart Glass technology
- » High sensitivity useful for static charge detectors for grain silos and other applications
- » Potential microfluidic applications

Technology Development Status

- » Material has been synthesized and is in the process of being implemented into prototype devices
- » Additional testing of mechanical and electrical properties is underway

Intellectual Property Status

- » A U.S. Provisional Patent Application has been filed

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Link to Vanderbilt technologies
available for licensing

