

R-8080

Lead Inventor: Stanislaus S. Wong, Ph.D., Associate Professor, Department of Chemistry

Title: Methods of Controlling the Morphology of Perovskite Submicron-Sized Particles during Molten Salt Synthesis

Background: The synthesis of complex ternary transition metal oxides, many of which possess a perovskite structure, has been of great industrial interest due to their interesting physical properties with applications in fields ranging from ferroelectricity, ferromagnetism, piezoelectricity, pyroelectricity, high-temperature superconductivity, to optoelectronics.

Professor Wong's research efforts have focused on demonstrating that the molten salt synthesis (MSS) method is a simple, versatile and highly cost-effective approach for producing crystalline, chemically purified, single-phase nanoscale materials at lower temperatures and often in overall shorter reaction times with little residual impurities as compared with conventional solid-state reactions. The intrinsic scalability and flexibility of this technique render it as a highly fabrication method for producing a range of ternary metal oxides.

Technology Description: By isolating and systematically analyzing the individual roles of salt medium, surfactant, reaction temperature, reaction time, precursor type, amount of salt, heating rates, and precursor ratios in determining the overall product morphology, composition, size, and shape, Dr. Wong has been able to achieve a high degree of tunability with respect to parameter selection for molten salt chemical reactions thereby allowing for production of large amounts of purified products with predictable, reproducible, and reliable morphology. In particular, the generalizable fabrication of ternary metal oxide perovskite structures with uniform, well-dispersed (in terms of size and shape) morphologies and control over crystallinity and homogeneity has been amply demonstrated.

Applications: Ferroelectricity, Ferromagnetism, Piezoelectricity, Pyroelectricity, High Temperature Superconductivity, Optoelectronics.

Advantages: Reliable Size, Shape and Composition Control for the Optimized Production of Ternary Metal Oxide Perovskite Structures. For example, the evolution of particle morphology from predominantly cubes to a mixture of cubes and spheres and finally to solely spheres has been demonstrated by increasing annealing/reaction times at suitable annealing temperatures, all other parameters being equal. Rationally controlling the shape of perovskite oxides is of great importance due to their strongly structure-dependent physical properties.

Patent Number / Publications: Patent Pending

Chem. Mater. 2007,19, 5238-5249

For additional information please contact: Ms. Donna Tumminello
Assistant Director
dtumminello@notes.cc.sunysb.edu
Phone: 631-632-4163