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Preparation and Properties of Nano-Particulate Conductive and Dielectric Oxides via Co-precipitation Using Various Chloride Sources¹

JAMES MASI², TIMOTHY HOLT³, MACKENZIE SULLIVAN⁴, University of Southern Maine — Conductive and dielectric oxides (In_2O_3 , BaTiO_3 , ZnO , ZnO:Al , and ZnO:In .) based nanoparticles have become a centerpiece for research in the scientific community over recent years. This work was conducted with the intent of developing a nano-particulate variable In, Zn, Ba, Ti (and doped combinations) oxide chemistry which was easy to implement at low temperatures ($<100^\circ\text{C}$) in the lab/classroom, and eliminating high temperature fabrication methods and metastability considerations. We used a metal chloride approach involving the eventual oxidation of combinatorial variations on the oxides. The initial tests were made by fabricating, from nano-particulate powders, both conductive thin layers and planar capacitors, calculating their electrical conductivity/permittivity, and their loss tangents at up to 1.8 GHz. The powders were properly suspended via wetting agents to prevent aggregation. The spin coated layers and plates were tested for both conductive/dielectric properties. The simplicity of the methods makes possible application in both secondary and university labs.

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