

Nanocomposites and Nanomaterials

Micelle composition and sedimentation stability of BaTiO₃ nanopowder suspensions with different acidic surfactants

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Surfactants are widely used for increasing of aggregative stability of powder suspension. Stabilization of BaTiO₃ nanopowder suspensions has a significant effect on possibility of thin films obtaining by suspensions-based methods such as screen printing, tape casting, ink-jet printing, etc. In addition suspension composition and mean particle size effect on roughness, density and dielectric properties of obtained films. Thus, investigations of the nature of the accession of surfactant molecules on the barium titanate particles and searching of relationships between micelle composition and solid particles stabilization in different solvents have a great importance.

Barium titanate has been modified by lactic, tartaric, acetic and citric acids in ethanol. Micelle composition has been indentified by IR-spectroscopy.

Based on Infrared Spectrum, it can be suggesting that connection of lactic acid molecule to the barium titanate particles occurs through bonding of O atoms of carboxyl group with powder surface. This is indicated with limit of stretching vibration of C-O and C=O bonds and further deformation of CH₃, CCC, CCO, OCH, HCH groups vibrations. Also, the relative mobility of the OCO group and the appearance of such characteristic peaks demonstrate that connection of COO⁻ group to barium titanate nanoparticles occurs by way of formation of noncoordinated bidentate carboxyl group. Changing of acidic modifier type results in various adsorption types of carboxyl group on BaTiO₃ surface.

The concentration of BaTiO₃ stabilized particles in ethanol suspensions with lactic acid addition was 1,73 %. Such acid as tartaric, acetic and citric give a higher percentage of stabilized particles (2,7 %, 2,97% and 3,75% in accordance) because of another mechanism for accession of carboxyl group to barium titanate nanoparticles.