Synthesis of BaTiO3 nanoparticles via hydrothermal method

ABSTRACT

In this work, BaTiO3 nanoparticles were synthesized through hydrothermal method. The powder obtained from the hydrothermal process (as-synthesized powder) was calcined at 1000 °C. The phase formation and morphology of the as-synthesized and calcined powders were studied using X-ray diffraction (XRD), thermogravimetric (TGA) and differential scanning calorimetry (DSC) analyzer, and transmission electron microscope (TEM). The XRD data showed that the as-synthesized powder is partially amorphous. Upon calcining the powder at 1000 °C, highly crystalline BaTiO3 with tetragonal structure was obtained. As shown by TGA and DSC analysis, the precursor powder was completely transformed into BaTiO3 at 1000 °C. The presence of BaCO3 as an impurity phase in the powder is due to the lack of Ba2+ / Ti3+/4+. Transmission electron microscope images showed that the particle size of the as-synthesized powder increased after calcination due to crystal growth. In addition, nanocubes with the average size of around 11.66 nm were obtained as a result of the calcination compared to the ellipsoid like particles of the as-synthesized powder.

Keyword: BaTiO3; Hydrothermal synthesis; Nanomaterial; Self-assembly