Transformation of barium–titanium chloro–alkoxide compound to $BaTiO_3$ nanoparticles by $BaCl_2$ elimination.

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Streszczenie

In this Article, we present how the molecular precursor of binary oxide material having an excess of alkali earth metal can be transformed to the highly phase pure $BaTiO_3$ perovskite. Here, we synthesized and compared two barium–titanium complexes with and without chloride ligands to determine the influences of different ligands on the phase purity of binary oxide nanoparticles. We prepared two barium–titanium complexes, i.e., $[Ba_4Ti_2(\mu_6\text{-}O)(OCH_2CH_2OCH_3)_{10}(HOCH_2CH_2OCH_3)_2(HOOCCPh_3)_4]$ (**1**) and $[Ba_4Ti_2(\mu_6\text{-}O)(\mu_3,\eta_2\text{-}OCH_2CH_2OCH_3)_8(\mu\text{-}OCH_2CH_2OCH_3)_2(\mu\text{-}HOCH_2CH_2OCH_3)_4Cl_4]$ (**2**). The barium–titanium precursors were characterized using elemental analysis, infrared and nuclear magnetic resonance spectroscopies, and single-crystal X-ray structural analysis, and their thermal decomposition products were compared. The complex **1** decomposed at 800 °C to give a mixture of $BaTiO_3$ and Ba_2TiO_4, whereas **2** gave a $BaCl_2/BaTiO_3$ mixture. Particles of submicrometer size (30–50 nm) were obtained after leaching of $BaCl_2$ from the raw powder using deionized water. Preliminary studies of barium titanate doped with Eu^{3+} sintered at 900 °C showed that the dominant luminescence band arose from the strong electric dipole transition, $^5D_0$–$^7F_2$.

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