Soft Mechanochemical Synthesis of Barium Titanate

Biljana Stojanovic
Center forMultidisciplinary Studies University of Belgrade - Serbia And Montenegro

Abstract

Although ferroelectric materials are well-established ceramic materials and have been subject of intensive investigation in the past because of their technical importance, they still remain the focus of much research activities because of requirements of careful optimization of many parameters during their preparation. The solid-state reaction initiated by intensive milling in high-energy ball mills could be appropriate choice for the ceramic powder preparation, especially when the it is possible to synthesize materials at room temperature. Until now mechanochemical synthesis was successfully used to synthesize oxide or non-oxide powders, and solid solutions of various functional materials. Progress in processing of materials fabricated on the basis of BaTiO3, both at the powder synthesis stage and subsequent densification to solid component, is caused by increasing demands on the quality of the electronic ceramics. It was found that the mechanical activation of BaCO3 and TiO2 powders could give BaTiO3 after thermal treatment slightly lower then in conventional solid-state reaction. On the other hand, the mechanical activation of BaO and TiO2 could be associated with the mechanochemical synthesis and formation of perovskite BT phase. The barium titanate ceramic material was prepared starting from fresh prepared barium oxide and titanium oxide in rutile form. Mixture of BaO and TiO2 was milled in zirconiumoxide ball- mill during 30,60,120 and 240 minutes. The relation between powders and zirconium oxide balls during milling was 1:20. The XRD, DTA and TGA analysis were performed and it was shown that the formation of BT perovskite phase was initiated after 30 min.Longer time milling led to higher amount of perovskite phase and BT with well crystallinity was formed after 120 min. Sintering withouth pre-calcination step was performed at 13100C for 2 h with heating rate of 100C/min. The microstructure of thermally etched samples was rather homogeneous. The ferroelectric properties were performed.