Nanocomposites and nanomaterials

Processing of barium-strontium and lanthanum-lithium titanates nanoparticles and thin films by Pechini method

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Titanates of alkaline, alkaline earth and rare earth elements with perovskite structure are widely used in modern technology and a range of materials with a set of functional properties is based on them. A great attention attract dielectrics based on barium-strontium titanates (BST) [1] and ionic conductors based on lanthanum-lithium titanates [2]. Using of the Pechini method allows to produce thin nanoscale films of materials based of the BST and LLT what could greatly expand their applications. BST thin films are very attractive for microwave tunable applications due to the low tuning voltages, and the relatively low production cost. In the case of LLT based materials thin film production gives possibilities to develop miniaturized batteries for different technical and medical application. The most of the existing data on the sol-gel chemical processes devoted to the investigation of titanium and lanthanum subgroup ions complexation, while alkaline and alkaline earth ions study behavior paid little attention. Besides, there are not enough information about optimal thin film deposition and annealing conditions to high films density achievement.

The aim of this work were the study of polymerization and complexation processes accompanying BST and LLT sol-gel solutions formation, BST and LLT thin films production, the impact of heat-treatment on the thin films microstructure and density.

The present work polyesterification and complexation processes accompanying BST and LLT sol-gel solution formation have been studied. It has been shown that BST and LLT phases in thin film are forming in one-step at relatively low temperatures: 600 and 700 °C for BST and LLT respectively. It have been found that use of thermal shock in the both of BST and LLT thin films production allows to reduce the appearance of pores and cracks significantly.

1. *Fesenko E.G*. Perovskite family and ferroelectricity (Atomizdat, Moscow, 1972)
2. Lithium-ion Batteries / Ed. Chong Rae Park. – 2010. DOI: 10.5772/9120.