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COMPARISON OF THE YTTRIUM ALUMINIUM GARNET (YAG) NANOPOWDER PREPARATION METHODS

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This paper presents results of investigation of YAG powders synthesis process based on complexing properties of citric acid. Influence of citric acid estrification induced by propanol, or ethylene glycol on the system homogenity was investigated. These reagents were introduced to water solution of yttrium and aluminum nitrates. A variety of powders from Al_2O_3-Y_2O_3 system with different phase composition were obtained by altering the citrate to nitrate ratio. Evolution of the powders phase composition vs. temperature was investigated using DTA/TG, XRD, and FT-IR methods. The most interesting results were observed in case of citric acid – propanol – relative nitrates system. Mole ratio of these reagents equal 1:2.5:2.5 (nitrates (Al, Y) : citric acid : propanol) allowed to synthesize pure YAG phase powders at temperature as low as 950°C.

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EFFECT OF SYNTHESIS METHOD ON $BaTiO_3$ PROPERTIES

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Barium titanate ($BaTiO_3$) has been of practical interest for more than 60 years because of its attractive properties. $BaTiO_3$ can be prepared using different methods. It was detected a significant influence of used method on structure and properties of barium titanate materials.

In this paper powder of $BaTiO_3$ was prepared by two methods. The first one was synthesis from polymeric precursors through Pechini process (soft chemistry-PPM) which was carried out as a three–stage process from oganometallic complex [1]. The second one was a mechanochemical synthesis from powder mixture of BaO and TiO_2 [2]. In both cases $BaTiO_3$ was sintered for 2h at 1300^{o}C without pre-calcination step. The formations of phase and crystal structure of $BaTiO_3$ prepared by both methods were carried out by XRD analysis. The morphology and microstructure of obtained powders and sintered samples were examined by SEM method.

The XRD results of powders obtained by both methods indicate the formation of cubic phase of $BaTiO_3$ and tetragonal phase in sintered samples. $BaTiO_3$ powder prepared by PPM was well crystallized but significant amount of amorphous phase was detected for other method. SEM micrographs indicate that the morphology of the powders consists of particles and its agglomerates and their dimensions depend of the synthesis method. The powder prepared mechanochemically possesses higher number of agglomerates, particles are bigger and with irregular shape. Average particle size is about 100 nm and 250 nm for Pechini and mechanochemical process, respectively. Two types of domain configuration were observed in samples sintered at 1300°C for 2h and prepared from powders obtained by PPM.

Reference:

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[2] B.D. Stojanovic, C. Jovalekic, V. Vukotic, A. Z. Simoes, J.A. Varela, "Ferroelectric Properties of Mechanically Synthesized Nanosized Barium Titanate", *Ferro-electrics,* **319** (2005) 65-73.

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STRUCTURAL CHARACTERIZATION OF Cu^{2+} AND Fe^{3+} FUNCTIONAL CENTERS IN 'LEAD-FREE' $K_YNA_{(1-Y)}NbO_3$ PIEZOELECTRICS

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The volatile and toxic nature of PbO in PZT ($Pb(Zr_xTi_{1-x})O_3$) ceramics causes not only health but also environmental problems as being disposal and even during their processing. Therefore, although these ceramics are widely used in piezoelectric transducers, transformers, sensors and etc., lead-free alternative materials are currently investigated. Among these alternatives, the alkali niobate ferroelectrics ($(K_yNa_{1-y})NbO_3$, KNN) have been reported as one of the most promising materials due to their high Curie Temperature and electrical properties. In order to obtain dense compounds with decent properties, doping with different elements has to be performed. Though some dopants have good influences on the KNN perovskite structure, some do not. The aim of this study is to figure out the structure of Cu^{2+} and Fe^{3+} doped KNN ceramics via different EPR techniques since these dopants show paramagnetic characteristics. Further insight into the ferroelectric properties of such materials may be obtained by systematically characterizing their defect chemistry.