

PROCESSING AND DIELECTRIC PROPERTIES OF THE PbTiO₃ - Pb(M,Nb)O₃ (M=Mg, Sc) FERROELECTRIC CERAMICS

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Lead titanate based ferroelectric ceramics attract much attention due to their excellent electromechanical properties. On the other hand, dielectric and piezoelectric properties of these ceramics are extremely sensitive to composition inhomogeneity, lead vacancies and ordering in the cation sublattices.

In this work, influence of processing routes, additives and heat treatment conditions on dielectric properties of compositions in the vicinity of morphotropic boundaries in the systems (1-x) Pb(Mg_{1/3}Nb_{2/3})O₃ - x PbTiO₃, x=0.2÷0.36 (I) and (1-x) Pb(Sc_{1/2}Nb_{1/2})O₃ - x PbTiO₃, x=0.3÷0.4 (II) has been studied. The compositions have been synthesized using the "columbite" method. Ceramic samples prepared by the two-step firing and by hot pressing have been additionally annealed at 1000°C (5÷60 h) and then slowly cooled or air quenched. Phase content and structure of the samples have been controlled using X-ray diffraction and scanning electron microscopy. Dielectric measurements have been fulfilled in temperature range 300-800 K at frequencies 100 Hz - 1 MHz.

Pronounced frequency dependence of dielectric properties has been revealed for the samples I with rhombohedral structure. Diffuseness of the $\epsilon(T)$ and $\tan\delta(T)$ curves decreases in the samples which compositions approach to the morphotropic boundary, while dielectric properties of tetragonal samples do not depend on the measuring frequency.

It has been proved that dielectric properties of the samples may be significantly improved by additional annealing. Mechanisms of the relaxor behaviour stimulated by effects of the B cations disordering, lead vacancy creation and excess of MgO are discussed.

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