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Effect of the degree of a diffuse phase transitions on the behavior of polarization switching processes and elastic properties in multicomponent ceramics based on PZT

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The study of a number of ferroelectric-soft ceramics based on PZT shows that they exhibit properties characteristic of ferroelectrics-relaxors [1]. However, unlike relaxors they exhibit pronounced ferroelectric properties under certain conditions, as shown, for example, in [2]. Since multicomponent complex perovskite systems have structural disorder, the properties of such materials can exhibit features associated with the inhomogeneity of the phase state over a wide temperature range.

The purpose of this study is to investigate effect of the degree of a diffuse phase transitions on the behavior of polarization switching processes and elastic properties in multicomponent ceramics based on PZT:

1. $0.35PbTiO_3 – 0.21PbZrO_3 – Pb(Ni_{1/3}Nb_{2/3})O_3 – Zn_{1/3}Nb_{2/3}O_3$
2. $0.36PbTiO_3 – 0.33PbZrO_3 – Pb(MgZn)_{1/3}Nb_{2/3}O_3 – BaTiO_3 – SrZrO_3$

in a wide temperature range, including the region of phase transitions between two polar phases and the main phase transition from the ferroelectric phase to the cubic phase.

Figure 1 presents temperature dependence of the effective dielectric constant $\varepsilon'_{eff} = P/\varepsilon_0 E$ (P – the polarization determined by Sawyer-Tower method, E – the amplitude of the measuring field) in materials at frequency 1 Hz in wide range of temperatures of the diffuse phase transaction.

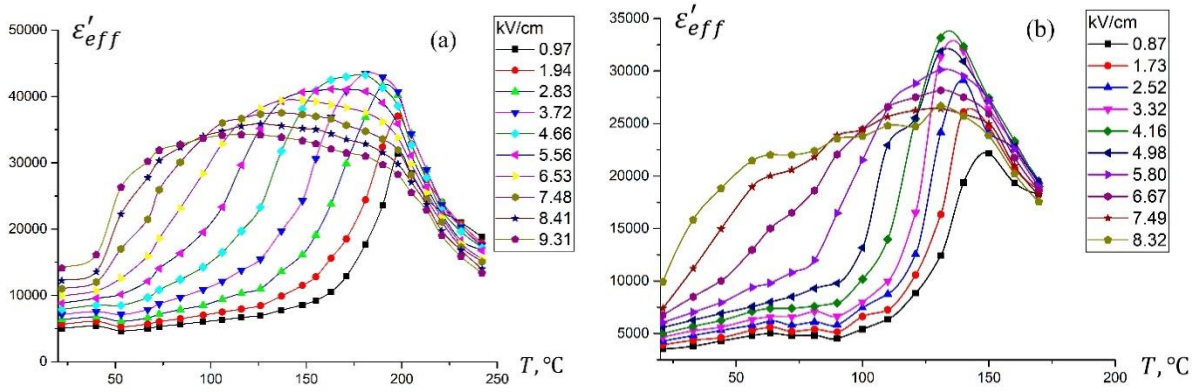

Figure 1. Temperature-frequency dependence ε'_{eff}, (a) – composition 1 and (b) composition 2.

1. A.A. Bokov, Z.-G. Ye, *J. Mater. Sci.* **41**, 31 (2006).
2. A.V. Skrylev, A.I. Burkhanov, G.M. Akbaeva, A.E. Panich, *Bull. Russ. Acad. Sci. Phys.* **82**, 372 (2018).