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Formation of mesoscopic nanostructures in materials with coexisting ferroelectric and antiferroelectric phases and their manifestation in a wide range of applications

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The talk contains results of investigations of the nanoscale structures of segregates formed in the inhomogeneous state of the coexisting ferroelectric and antiferroelectric phases in solid solutions of complex oxides with perovskite crystal structure. $PbZ_{r1-y}Ti_yO_3$ (PZT) based solid solutions are considered as examples of substances in which such mesoscopic nanostructures are realized in a wide interval of compositions. A result of detailed studies of these nanoscale structures segregates in physical properties of solid solutions which lead to the methods of effective control formation of such nanostructures. Presence of nanoscale structures segregates in materials with coexisting ferroelectric and antiferroelectric phases gave rise to the interesting physical properties of such compounds that create new possibilities in applications of these solid solutions as materials with extremely high piezoelectric parameters, substances with negative refractive index and materials with effective control of piezoelectric parameters by external electric field.

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