Griffiths phase manifestation in $(Pb_ySn_{1-y})_2P_2S_6$ ferroelectrics

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Ferroelectric instability in $Sn_2P_2S_6$ crystals is a result of non-linear coupling of soft polar and fully symmetrical optic modes, leading to three-well potential[1]. Such system can be described by two order parameters that are related with dipole and quadrupole moments, and as a result stable and metastable ferroelectric and paraelectric states can be realized. The Blume-Emery-Griffith model could be used in combination with ANNNI model[2,3] for the description of temperature - pressure - concentration phase diagram of $Sn_2P_2(Se_xS_{1-x})_6$ crystals with incommensurate phase. In the $Sn_2P_2S_6$ crystals under compression existence of tricritical point is expected. At higher pressure beyond the tricritical point the presence of metastable states is possible. Recent data[4] of the neutron diffuse scattering in $Sn_2P_2S_6$ crystal in the vicinity of the phase transitions at high hydrostatic pressures, as well as Monte Carlo simulation of its $p-T$ diagram, give evidences of pressure induced metastable states formation near $p \approx 0.6$ GPa. For $(Pb_ySn_{1-y})_2P_2S_6$ mixed crystals the tin by lead substitution increases ionicity of chemical bounds what is similar to hydrostatic pressure influence. Possibility of the Griffiths phase appearance in $(Pb_ySn_{1-y})_2P_2S_6$ crystals with diluted ferroelectric sublattice is investigated. The ultrasound velocity and attenuation peculiar behavior is compared with hypersound characteristics on Brillouin scattering data and with results of dielectric measurements.

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