

Effect of Hydrostatic Pressure on Thermodynamic Properties of Ferroelectric GPI

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On the basis of the model of ferroelectric GPI [1], modified by taking into account piezoelectric coupling of proton subsystem and lattice strains ϵ_i , within the two-particle cluster approximation we have calculated components of crystal polarization, components of dielectric permittivity tensor (fig.1), piezoelectric and thermal properties of the crystal at different values of hydrostatic pressure. Pressure decreases the phase transition temperature T_c (fig.2). The long-range interactions in our theory much stronger change under pressure, then short-range for nondeuterated crystal. At the proper set of parameters satisfactory description of experimental data is obtained.

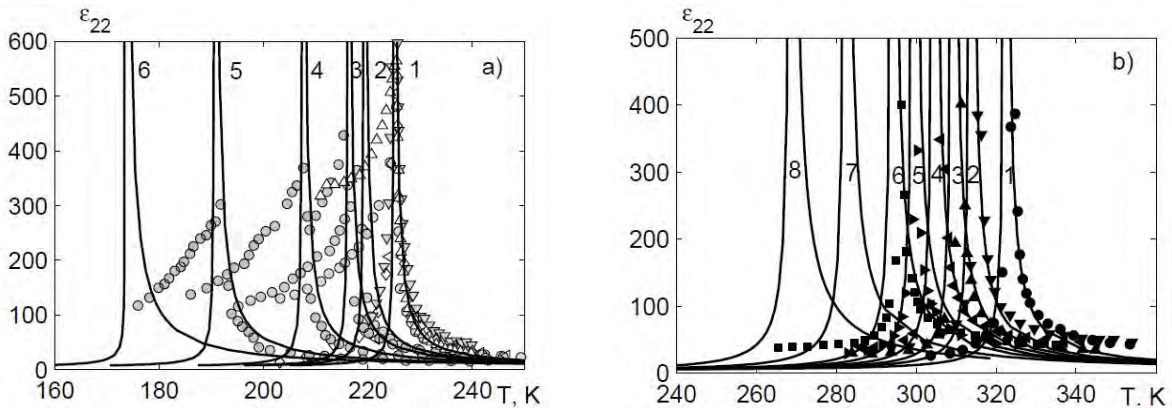


Figure 1. The temperature dependence of the longitudinal dielectric permittivity of GPI (a) crystal at different values of pressure p (10^9 dyn/cm^2): 0.00 – 1, ∇ [4], Δ [5], \diamond [6], \circ [2]; 0.6 – 2, \circ [2]; 0.9 – 3, \circ [2]; 1.7 – 4, \circ [2]; 3.0 – 5, \circ [2]; 4.0 – 6 and $\text{GPI}_{0.2}\text{DGPI}_{0.8}$ at different values of pressure p (10^9 dyn/cm^2): 0.0 – 1, \bullet [3]; 2 – 2, \blacktriangledown [3]; 3 – 3, \blacktriangle [3]; 4 – 4, \blacktriangleleft [3]; 5 – 5, \blacktriangleright [3]; 6 – 6, \blacksquare [3]; 8 – 7; 10 – 8.

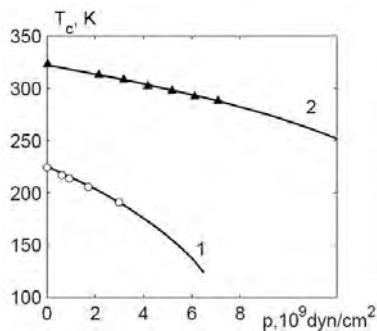


Figure 2. The pressure dependence of temperature T_c of $\text{GPI}_{1-x}\text{DGPI}_x$ at different concentrations of deuterium x : 0.00 – 1, \circ [2]; 0.8 – 2, \blacktriangle [3].

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