Thermodynamic Properties of Ferroelectric Glycine Phosphite

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Model of ferroelectric Glycine Phosphite (GPI) crystal [1] is modified by taking into account piezoelectric coupling of proton subsystem and strains ε_i. Within the two-particle cluster approximation for short-range interactions and mean field approximation for long-range interactions we calculate the thermodynamic potential of the system. Using the appropriate equations of state, we calculate the crystal polarization (fig.1), strains ε_i, molar entropy and heat capacity, longitudinal (fig.2) and transverse dielectric permittivities, piezoelectric moduli and elastic constants of the crystal. At the proper set of parameters satisfactory description of experimental data for partially deuterated crystalls is obtained.

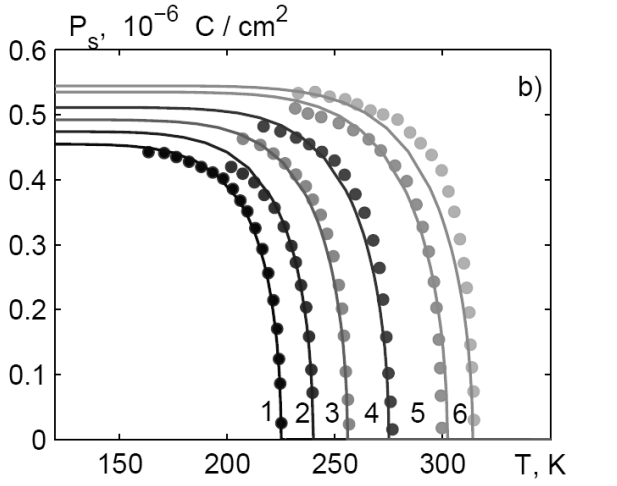

Figure 1. Temperature dependence of the spontaneous polarization of GPI crystal at different concentrations of deuterium *x*: 0.00 – 1, 0.16 – 2, 0.31 – 3, 0.47 – 4, 0.67 – 5, 0.75 – 6. Experimental points for P_s taken from [2].

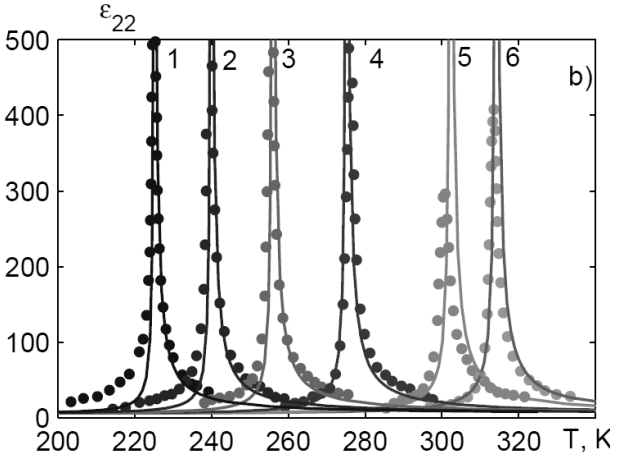

Figure 2. Temperature dependence of the longitudinal dielectric permittivity of GPI crystal at different concentrations of deuterium *x*: 0.00 – 1, 0.16 – 2, 0.31 – 3, 0.47 – 4, 0.67 – 5, 0.75 – 6. Experimental points for ε_{22} taken from [3].

[1] I. Stasyuk, O. Velychko, *Ferroelectrics* **300** (2004) 121.
[2] J. Nayeem, T. Kikuta, N. Nakatani, F. Matsui, S.-N. Takeda, K. Hattori, H. Daimon, *Ferroelectrics* **332** (2006) 13.
[3] J. Nayeem, H. Wakabayashi, T. Kikuta, T. Yamazaki, N. Nakatani, *Ferroelectrics* **269** (2002) 153.