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A Model of Glassy Phase for HCP ^{4}He Crystals

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A model of close-packed polytype with the structure of chaotic stacking faults is applied to interpret anomalous thermodynamic properties of disordered glassy phase in solid HCP ^{4}He [1]. The temperature dependences of solid ^{4}He free energy, pressure and heat capacity have been calculated. The HCP-based polytype is a crystal with perfect ordering along the plates, but atomically disordered in perpendicular direction. Such a crystal structure can be reduced to an anisotropic elastic medium with specific dispersion law. The theoretic results are compared with corresponding experimental data known from literature. The quantitative agreement between theory and experiment has been found and discussed. The developed polytype model can be applied to interpret the evolution of the ^{4}He lattice defect structure under external pressure at variation of the temperature.
[1] T.N. Antsygina, M.I. Poltavskaya, K.A. Chishko, Low Temp. Phys., 41, 743 (2015).

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IR-spectrometric studies of the spin-nuclear conversion in the vicinity of α- β- transition temperature of methane

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The features of the solid methane properties are determined largely due to the nuclear spin relaxation processes and their influence on the rotational and translational subsystems of the methane crystal lattice. This most clearly affects the vibrational spectra of methane in the range of translational and librational vibration. This article presents results of the studies of the effect of condensation temperature of methane on the IR-spectra of the resulting thin films. In contrast to the rather large number of studies of equilibrium solid methane samples, we consider the results obtained directly in the course of samples' cryocondensation. Measurements in the vicinity of the phase transition temperature T = 20.4 K in the range from 14–32 K were carried out.