Quadrupole Effects on ^{73}Ge NMR Spectra in Isotopically Controlled Ge Single Crystals

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NMR spectra of ^{73}Ge (nuclear spin $I = 9/2$) in perfect single crystals of germanium with different isotopic content were measured at 80, 300, and 450 K. The observed specific line shapes gave evidence of the isotopic disorder, in particular, abnormal broadening of the spectrum was found for the magnetic field directed along the [111] axis. Local lattice deformations in the germanium crystal lattice due to "isotopic disorder" were calculated in the framework of the adiabatic bond charge model. The results were applied to study random non-cubic crystal field interactions with the nuclear quadrupole moments and corresponding effects on NMR spectra. The simulated second moment of the resonance frequency distributions caused by the magnetic dipole-dipole and electric quadrupole interactions are used to analyze the lineshapes, theoretical predictions being in a qualitative agreement with the experimental data.

Key words: Isotopic Disorder; Ge Single Crystal; NMR Spectra; Quadrupole Effects.