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Ultrasound Velocity Measurements in the Geometrically Frustrated Spinel $MgCr_2O_4$ TADATAKA WATANABE, Department of Physics, College of Science and Technology (CST), Nihon University, Chiyoda, Tokyo 101-8308, Japan, YUSUKE KOUSAKA, Department of Physics and Mathematics, Aoyama-Gakuin University, Sagamihara, Kanagawa 229-8558, Japan, KEISUKE TOMIYASU, Department of Physics, Tohoku University, Aoba, Sendai 980-8578, Japan
— Magnesium chromite spinel $MgCr_2O_4$ is a geometrically frustrated magnet with the Néel temperature $T_N \simeq 13$ K, and the Weiss temperature $\theta_W = -390$ K. Recent inelastic neutron scattering experiments provided a compelling evidence for the spin molecular ground states in not only the paramagnetic phase but also the antiferromagnetic phase. We performed ultrasound velocity measurements of $MgCr_2O_4$ in all the symmetrically independent elastic moduli of C_{11}, $(C_{11} - C_{12})/2$, and C_{44}. Temperature dependence of all of these elastic moduli exhibits a remarkable softening in the paramagnetic phase. Taking into account the absence of orbital degrees of freedom in Cr^{3+} $(3d^3)$ in $MgCr_2O_4$, the spin degrees of freedom should play a significant role for the elastic softening. The most probable origin for the elastic softening in the paramagnetic phase is the strong coupling of the acoustic phonons to the molecular spin fluctuations.

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