EXPERIMENTAL STUDY OF THE THERMAL TRANSPORT IN $CsNiF_3$ - S=1 QUANTUM CHAIN

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9.7 cm

An experimental study of the heat transport in $CsNiF_3$ single crystal has been performed in the temperature range from 2 to 13 K in a zero magnetic field, $B = 0$ T, as well as in sufficiently large magnetic fields, $B \sim 6$, 9 T, inducing ferromagnetic ground state along the hard axis c. $CsNiF_3$ represents an $S = 1$ quasi-one-dimensional XY ferromagnet with the intrachain exchange coupling $J/k_B \approx 24$ K and single ion anisotropy $D/k_B \approx 8$ K with ordering temperature $T_N = 2.7$ K. Comparison of the phonon and magnon velocities suggests that phonons are the main heat carriers in this magnetic insulator. The thermal conductivity in $B = 0$ T was analysed in the frame of a standard Debye model. The temperature dependence of the effective phonon mean free path was calculated from experimental data, and the enhancement of the phonon mean free path in $B \neq 0$ T was obtained. Several mechanisms responsible for this enhancement are discussed.

13.4 cm

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