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Mössbauer studies on magnetism in FeSe

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ABSTRACT

Iron selenide (FeSe) was used to investigate magnetic properties by using Mössbauer spectroscopy. The crystalline structure of the sample was found to be tetragonal and hexagonal with a 3*c* structure. The temperature-dependent magnetic susceptibility curve under 100 Oe confirmed the spin rotation temperature T_S = 150 K. Based on the applied field dependent magnetization measurements up to 15 kOe at 295 K, the saturation magnetization and coercivity were found to be 8.03 emu/g and 357.40 Oe, respectively. The spin rotation process of the sample from the dependence temperature ZFC-FC curves occurs at approximately T_S. The Mössbauer spectra below the Néel temperature (T_N) were fitted with a doublet for the tetragonal phase and three sextets (A, B, and C sites) for the hexagonal phase. The spectrum was fitted to a single line at T_N = 500 K. We also observed abrupt changes in H_{hf} and ΔE_Q at the spin rotation temperature. The Fe charge states in the tetragonal and hexagonal phases are found to be ferric and highly covalent ferrous ion (or high-spin ferric), respectively.