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Magnetic Properties of Fe-doped 2H–TaS_2

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Fe_xTaS_2 (x = 0.25, 0.33, and 0.4) was prepared by using a solid state reaction method. The crystallographic structure and magnetic properties of the prepared compounds were investigated by using X-ray Diffraction, superconducting quantum interference device magnetometer, and a Mössbauer spectrometer. The crystal structure of Fe_xTaS_2 (x = 0.25, 0.33, and 0.4) was found to be hexagonal with space group $P6_322$. The lattice constants a_0 and c_0 increase with increasing Fe concentration. The magnetization and the coercivity also increase with increasing Fe concentration. The magnetic transition temperatures of Fe_xTaS_2 (x = 0.25, 0.33, and 0.4) were found to be 89, 150 and 47 K, respectively. The Curie-Weiss temperatures of Fe_xTaS_2 (x = 0.25, 0.33, and 0.4) were found to be 80, 37, and -82 K, respectively. The isomer shift value of $Fe_{0.33}TaS_2$ at 300 K was 0.68 mm/s relative to the Fe metal, which is consistent with the Fe^{2+} valence state. The Debye temperature of $Fe_{0.33}TaS_2$ was determined to be Θ_D = 486 K.

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