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Strong crystal anisotropy of magneto-transport property in Fe_3Si epitaxial films S. Y. HUANG, H. Y. HUNG, P. CHANG, W. C. LIN, S. F. LEE, M. HONG, J. KWO, Physics Department, National Tsing Hua Univ, Institute of Physics, Academia Sinica, Materials Science and Engineering Department, NTHU, Taiwan. — We report transport study of the epitaxial Fe_3Si/GaAs heterostructures prepared by the molecular beam epitaxy growth. The temperature dependence of resistivity can be described as T^3 dependence in terms of Bloch-Gruneisen formula. Below 50 K, the T^3 term lent supports to the anomalous single-magnon scattering predicted for the half-metallic material. By changing the current direction from parallel to the magnetic hard axis to the magnetic easy axis, the anomalous zigzag magnetoresistance (MR) behavior can be altered to $\cos^2(\theta_M)$ expected for the anisotropic MR behavior at high field $\sim$500 Oe, with a maximum and a minimum occurring at the magnetic field parallel and perpendicular to the current direction, respectively. However, at low field below 100 Oe, the MR showed an interesting step function-like dependence at a critical angle $\theta_{critical,}$corresponding to the magnetic hard [110] axis. Our study showed unusually strong dependence of magneto-transport properties on crystal anisotropy in the plan of the epitaxial Fe_3Si/GaAs films.

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