Growth and Transport Properties of Epitaxial Fe-Ga thin film on GaSb (100)

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The Fe-Ga alloys have recently attracted great interests because theyexhibited ferromagnetic properties with high Curie temperature (T_C), high saturation magnetization (M_S) and unique magnetostriction properties which are promising to real applications such actuators, acoustic sensors, torque sensors, and positioning devices in particular for micro and nano-electromechanical systems (MEMS and NEMS) and the integrated magnetostrictive devices (MagMEMS) [1-4]. Clark *et al.* reported that in the bulk $Fe_{1-x}Ga_x$ ($4<x<27$) alloy, the magnetostriction constant (λ_{100}) has two maximum values; 265 ppm at x = 19 and 235 ppm at x=27[1]. Similar results are reported by Kellogg et al. that single crystal $Fe_{0.81}Ga_{0.19}$ has the saturation magnetostriction and magnetization of 298 ppm and 1265 emu/cm^3 at 80 ^oC, respectively, and by Cullen et al. that $Fe_{0.82}Ga_{0.18}$ has ~300 ppm [5,6]. Expitaxial Fe-Ga thin film has been grown on GaSb (100) substrate by molecular beam epitaxy. The bcc -Fe crystal structure (A2) with the lattice parameter as 2.967Å was observed by X-ray diffraction. The temperature dependent resistivity showed metallic behavior. The Hall resistance, RHall, is given by the sum of the ordinary Hall effect (OHE) due to the Lorentz force and the anomalous Hall effect (AHE) originating from asymmetric scattering in the presence of magnetization. The carrier densities,which are calculated from Hall measurements as 2.05x10^{21} cm-3 at 370K and decrease to 1.11x10^{21} cm^{-3} at 20K.

참고문헌

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