MAGNETIC PROPERTIES OF Ni$_2$MnGa HEUSLER ALLOY FILMS

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Ni–Mn–Ga Heusler alloys have recently attracted a great attention since they reveal a magnetically driven shape memory effect. We report our results concerning structure and magnetic properties of off-stoichiometric Ni–Mn–Ga films prepared by magnetron sputtering or flash-evaporation. The aim of this contribution is to investigate the effect of ordering on the magnetic properties of Ni-Mn-Ga films. The films with composition Ni$_x$Mn$_y$Ga$_z$ ($x = 50 \pm 5$, $y = 25 \pm 5$, $z = 25 \pm 5$) were deposited on mica or glass substrates at room temperature. The films were annealed in a high vacuum at 770 - 780 K for 0.1 to 1 hr. XRD at room temperature reveals the presence of B2 (or L2$_1$) type of structure. Magnetic properties were studied by ferromagnetic resonance (FMR) at temperatures from 78 K to 500 K. It is shown that the magnetic properties of the films critically depend on structural ordering. The as-received films are practically nonmagnetic with no trace of a martensitic transformation while those annealed at the highest temperatures show the magnetization $M(78K) \approx 600$ G, the Curie temperature $T_C \approx 390$ K and the martensitic transformation at $T_M = 200 - 300$ K depending on composition. Results show that both the effective magnetization and FMR linewidth are useful for monitoring structural ordering in these films.

Subject category:
3. Transition Metals, Alloys and Compounds

Presentation mode:
poster

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