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Correlation of structural ordering with magnetic properties of Pulsed Laser Deposited Co₂FeGa Heusler alloy thin films

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Abstract:

In the present contribution, structural and magnetic properties of Pulsed laser deposited (PLD) Co₂FeGa (CFG) thin films have been studied as a function of substrate temperature. Structural investigation carried out by X-Ray Diffraction (XRD) measurement reveals mixed phase cubic structure of the films which changes from a nearly ordered to highly disordered phase with an increase in substrate temperature. Grazing Incidence X-Ray Diffraction (GIXRD) study shows the presence of disordered A2 phase similar to the bulk target. Grazing Incidence X-Ray Reflectivity (GIXR) measurement reveals the formation of bi-layer structure in the films with different density and thickness though the overall thickness remains same. Field Emission Scanning Electron Microscopy (FESEM) study shows the formation of a droplet-like morphology of the films. Extended X-ray Absorption Fine Structure (EXAFS) study serves a major role in complementing the XRD results and also shows a strong hybridization of Co with Ga maintaining the half metallicity. A novel approach in analyzing the EXAFS data additionally gives quantitative estimation of the different kinds of disorders present in the samples at the atomic level. In addition to this, magnetization result suggests that the films grown at lower substrate temperatures acts as proper ferromagnet following the

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