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Growth of Single Crystal $Fe_{1-x}Ga_x$ Thin Films[1] ADAM MCCLURE, PAUL RUGHEIMER, H. LI, Y.U. IDZERDA, Physics Department, Montana State University — $Fe_{1-x}Ga_x$ alloys are of recent interest because of their magnetostrictive properties. In bulk form these materials display cubic magnetic anisotropy. We have grown single-crystal thin films of $Fe_{1-x}Ga_x$ of various alloy concentrations using Molecular Beam Epitaxy (MBE). We find that the films display either a conventional (bulk-like) cubic magnetic anisotropy or a uniaxial anisotropy on top of an underlying cubic anisotropy. A Gallium dependent uniaxial anisotropy is introduced by growing the films on GaAs(001) or ZnSe/GaAs(001) substrates. Alternatively, films which show purely cubic magnetic anisotropy have been produced by growing the films on MgO(001) substrates. Thin film $Fe_{1-x}Ga_x$ alloys can be grown with much higher content of Gallium than bulk while preserving BCC crystal structure. Reflection High Energy Electron Diffraction (RHEED) performed during growth as well as post-growth magnetic anisotropy measurements will be discussed. Growth parameters and a mechanism for the observed uniaxial anisotropy that is consistent with each of the substrates used will be discussed.

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