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MECHANISM FOR ION BEAM MODIFICATION OF MAGNETIC PROPERTIES OF THIN FILMS AND MULTILAYERS.

We have investigated the physical mechanism whereby ion irradiation produces large changes in the magnetic properties of thin films suitable for magnetic recording, e.g. [Co/Pt]n multi-layers, or Fe-Pt alloy films. These effects are the basis of ion beam patterning techniques proposed for future high density storage. Samples were irradiated with He, N, Ar or Xe ions at energies between 30 keV and 1 MeV, with doses spanning the range 10 - 5 10 ion/cm . We then examined the dependence of the magnetic properties on ion energy, species and dose, and on the media structure, (number and thickness of layers; stoichiometry). Structural characterization was done using AFM, MFM, LTEM, XRR, RBS, and ion channeling. We attribute the magnetic effects primarily to short-range chemical disordering effects at multilayer interfaces or within alloy media, induced by ion beam mixing. The model appears to be supported by TRIM simulations.