

Abstract Submitted  
for the MAR05 Meeting of  
The American Physical Society

**Anhyseretic magnetization of thin Ni-Fe films under stress and plastic deformation** PETER FINKEL, Thomson, EDWARD GARRITY, Thomson, SAMUEL LOFLAND, Rowan University — The magnetostriction contribution to anhyseretic magnetization under elastic stress and the effect of the plastic strain on the hysteresis loops in thin film Ni-Fe are discussed. Also, a role of the plastic deformation interrelated with the elastic stress in the magnetization process is established. Anhyseretic permeability was extracted from the anhyseretic B-H curves constructed by ac demagnetization of a sample at given longitudinal dc fields. Observations indicate that the large positive magnetostriction constant of Fe-Ni samples leads to higher susceptibility and lower coercivity with increased tensile stress, while the large volume magnetostriction results in reduced saturation magnetization. Above a critical stress, however, while stress remains far below the macroscopic elastic limit, this trend reverses direction. An irreversible change in magnetic properties is observed when the stress is removed, and is exacerbated by subsequent applications of increasing stress. A mechanism for this higher stress effect is hypothesized to be related to increased dislocation density and domain wall pinning due to localized plastic strain.

Peter Finkel  
Thomson

Date submitted: 06 Dec 2004

Electronic form version 1.4