Comparison of the Stress and Magnetic Properties of Laminated FeCo/Ru and FeCo/NiFe Thin Films for Write Pole Applications

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Introduction

- Soft high moment Fe$_{65}$Co$_{35}$ (FeCo) films are potential candidates for write head applications for high density magnetic recording.
- Sputtered FeCo films show high coercivity with no distinct uniaxial anisotropy, as well as large magnetostriction. The use of seed layers, for instance, Ru, improves the soft properties significantly by reducing the grain size [H. S. Jung and W. D. Doyle J. Appl. Phys., 93, 6462 (2003)].

FeCo thin films laminated with Ru or NiFe have been investigated with a view to minimizing the overall stress and resultant magnetostriction.

We have studied the magnetic properties and stress of laminated Ru/FeCo and NiFe/FeCo thin films as a function of layer structure and deposition conditions.

Comparison of Magnetostriction for Laminated Ru/FeCo and NiFe/FeCo Multilayers

- Linewidth of magnetostriction at Ru/FeCo.
- Linear fit of magnetostriction at NiFe/FeCo.

Experimental Details

- [lamination layer/FeCo]$_n$, N = 1, 2, 3, 4, 5, 10 etc.
- Conventional DC magnetron sputtering
  - Target: Fe$_{65}$Co$_{35}$, Ru, NiFe
  - Base pressure: <5 × 10$^{-7}$ Torr

- Sputtered FeCo films show high coercivity with no distinct uniaxial anisotropy, as well as large magnetostriction. The use of seed layers, for instance, Ru, improves the soft properties significantly by reducing the grain size [H. S. Jung and W. D. Doyle J. Appl. Phys., 93, 6462 (2003)].

- Ru, NiFe and FeCo depositions were done with power of 80-150 W and 3mTorr Ar gas pressure.

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