Objective
• Assess Magnetic Thin Film Alloy Physical Properties
• Provide Educational Research Project (Solid State Physics)

Approach
• Investigate Magnetic Hysteresis Effects
• Two Experimental Methodologies:
  1. Extraordinary Hall Effect Resistance Measurements
  2. Magneto-Optic Kerr Effect (MOKE) Data

Ordinary Hall Effect
(metals and semi-conductors)

Extraordinary Hall Effect
(concentrations of magnetic materials)

Lorentz Force
\[ \mathbf{F}_L = q(\mathbf{E} + \mathbf{v}_d \times \mathbf{B}) \]
\[ \mathbf{v}_d = \text{drift velocity} \]
\[ \mathbf{E} = \text{electric field vector} \]

Hall Resistance
\[ R_H = \frac{V_H}{I} = \frac{R_B B}{l} \]
\[ R_B = \text{Ordinary Hall Coefficient} \]

Extraordinary Hall Resistance
\[ R_{EH} = \frac{R_B B + \mu_i M}{l} \]
\[ R_{EH} = \text{Extraordinary Hall Resistance} \]
\[ R_B = \text{Extraordinary Hall Coefficient} \]
\[ \mu_i = \text{Permeability of free space} \]
\[ M = \text{Magnetization} \]

Sample Specifications
• Film thicknesses of 2300-2500 Å
• Current results for the 20% Ni in Cu setup
• Other sample compositions: 1%, 5%, and 10%, Ni in Cu
• Atomic fractions prepared using arc melting / thermal evaporation

Sample Specifications

Prior Extraordinary Hall Effect Data and Observations

Future Magneto-Optical Analyses
• CuNi alloy thin films
• Concentrations of Ni in Cu (1%, 5%, 10%, 20%, 50%)

Alternative Magneto-Optical Applications
• Kerr Cell Analyses
• Birefringence Analyses
• Structural Analysis – Magnetostriiction (stress / strain)
• Optical Communications
• Spectral Analyses

References