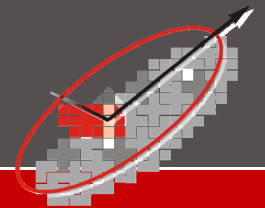


Collective Magnetic Properties of GLAD Cobalt Needles and Nanocoils



UNIVERSITY OF NEBRASKA-LINCOLN



A. Kjerstad¹, D. Schmidt¹, T. Hofmann¹, M. Saenger¹, R. Skomski², M. Schubert¹, E. Schubert^{1*}

¹ Department of Electrical Engineering and Nebraska Center for Materials and Nanoscience, University of Nebraska-Lincoln, U.S.A.

² Department of Physics and Astronomy and Nebraska Center for Materials and Nanoscience, University of Nebraska-Lincoln, U.S.A.

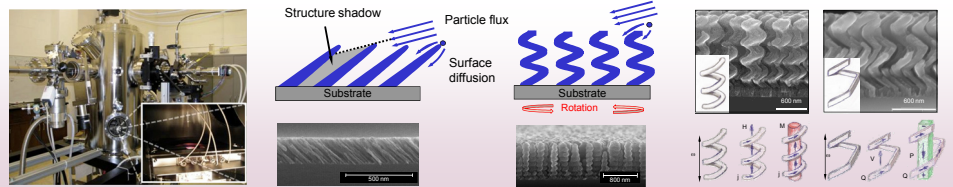
*evaschub@engr.unl.edu

<http://ellipsometry.unl.edu>

Our Message

- Glancing Angle Deposition fabricated Cobalt slanted needles and nanocoils
- Superconducting Quantum Interference Detector (SQUID) used to measure geometry dependent anisotropy
- Magneto Optic Kerr Effect (MOKE) and Zeeman splitting measured

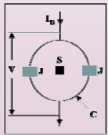
Glancing Angle Deposition of Sculptured Thin Films



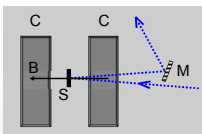
Experiment

SQUID

Highly sensitive magnetometer based on superconducting loops (C) containing Josephson junctions (J) through which current I_0 flows. Measurements of induced voltage (V) from sample (S) were taken at room temperature.



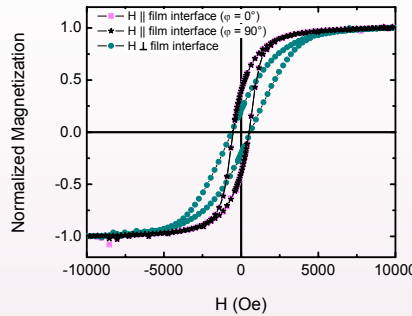
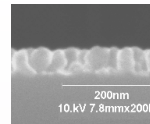
MOKE



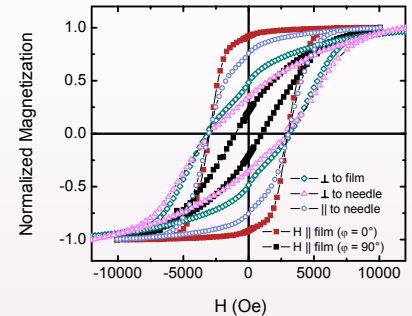
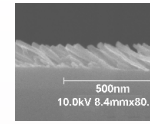
Polarized light is reflected off sample (S) within a **B** field between the magnet poles (C). The reflected light is then directed to the mirror (M), then to the ellipsometer detector. Data was collected in the spectral range from 1.0 - 3.2 eV and exemplary hysteresis loops recorded at 2.3 eV.

Results and Discussion

Cobalt Sculptured Nanocoils

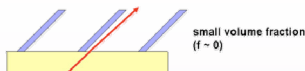


Cobalt Slanted Needles



Theory

Mean Field Approach

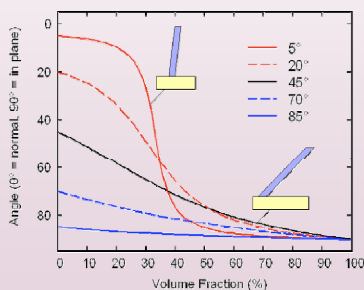


Large spacing between needles results in easy axis (red) parallel to needle.



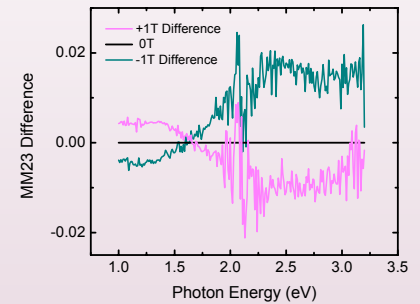
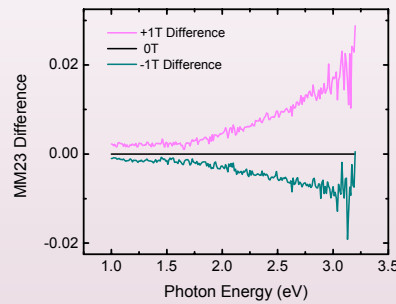
Closely packed needles result in easy axis (red) between substrate and slanted needles, proportional to packing density.

Easy Axis Orientation



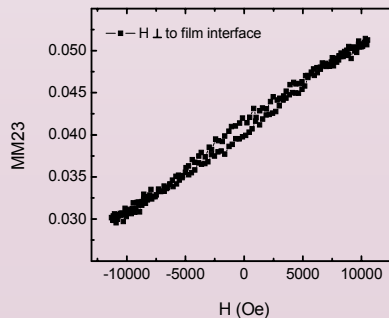
Packing fraction f affects easy axis

Zeeman Splitting



MOKE

Averaged data over three loops measured at 2.3 eV



Averaged data over three loops measured at 2.3 eV

