

**FABRICATION, MAGNETIC AND STRUCTURAL PROPERTIES OF THE ARRAYS OF COBALT NANOWIRES OF 18 TO 78 NM DIAMETER AND A FILM**

H.R. Khan<sup>1,2</sup> and K. Petrikowski<sup>1</sup>

<sup>1</sup>FEM, Materials Physics Department, Schwaebisch Gmuend, Germany and <sup>2</sup>Department of Physics, University of Tennessee, Knoxville, TN., U.S.A.

Arrays of magnetic nanowires possess very different magnetic properties compared to bulk materials (1,2). The diameter, interwire distance, and the length of the nanowires effect the structural and magnetic properties. Nanomagnet arrays are interesting for the applications such as high density storage media, micromagnetic sensors and for the fundamental understanding of nanostructured magnetic films. Arrays of nanowires of 18 to 78 nm diameter, high aspect ratio of 8 to 140 and different interwire distances are prepared by electrodeposition of Co in the pores of anodic alumina. A Co film is also deposited on a copper substrate. The Co-Al<sub>2</sub>O<sub>3</sub> film was removed from the aluminium substrate and powdered to obtain a random distribution of nanowires in the Al<sub>2</sub>O<sub>3</sub>. Co nanowire arrays, powder and the film show a hcp structure and different preferred crystallographic orientations. Co arrays show perpendicular magnetic anisotropy due to the shape anisotropy and crystallographic orientation effects whereas the nanowire powders of Co-Al<sub>2</sub>O<sub>3</sub> show no magnetic anisotropy and a superparamagnetic effect and the Co film shows an inplane magnetic anisotropy. The Coercivity H<sub>c</sub> of 18 nm diameter arrays with magnetic field perpendicular to the plane of nanowire arrays decreases linearly from 1858 Oe to 1300 Oe and the squareness (Mr/M<sub>s</sub>) increases from 0.8 to 0.9 with increasing nanowire length. The nanowire arrays of diameter 30 and 78 nm show lower values of H<sub>c</sub> and Mr/M<sub>s</sub>. The H<sub>c</sub> and Mr/M<sub>s</sub> values of the nanowire arrays decrease exponentially with increasing nanowire diameter due to increasing magnetostatic interaction. Analysis and comparison of the magnetic and structural data of the nanowire arrays, nanowire powders of Co-Al<sub>2</sub>O<sub>3</sub> and the films in relation to the crystallographic structure, nanowire diameter and the interwire distance is described.

**Acknowledgements**

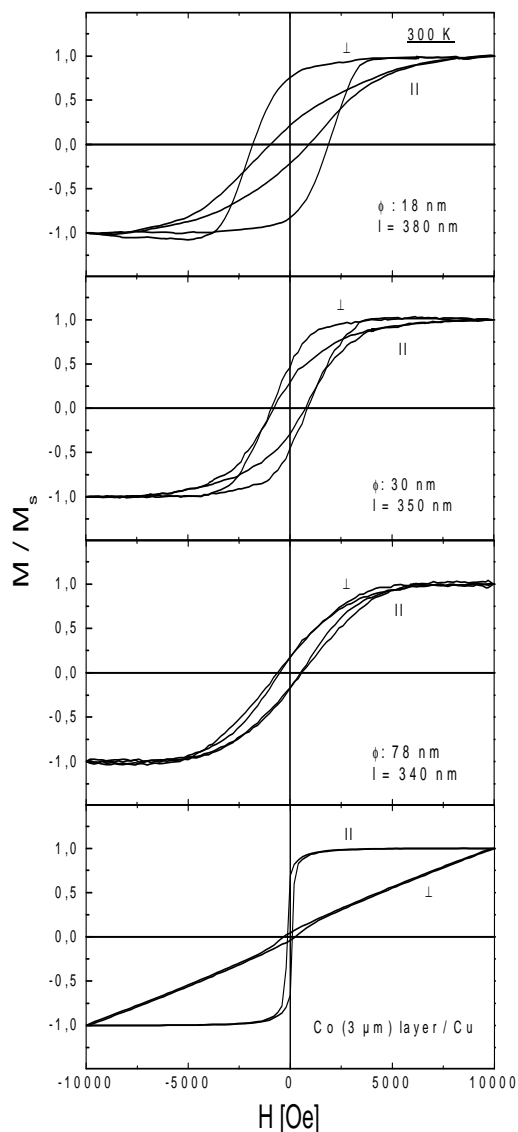
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**References**

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