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Comparative studies of Co nanowires of different diameters electroplated into porous aluminum oxide membranes ZUXIN YE, HAIDONG LIU, ZHIPING LUO, HAN-GIL LEE, WENHAO WU, D. G. NAUGLE, I. LYUKSYUTOV, Texas A & M University — The correlation between the structural and magnetic properties of template-electroplated Co nanowires has been investigated. Co nanowires of diameters either 65 or 200 nm were fabricated by electroplating Co into the pores of anodic aluminum oxide membranes. Strikingly different structures were observed in these two types of Co nanowires. The 65 nm-thick Co nanowires are composed of long Co single crystal segments with a hexagonal close-packed major phase, while the 200 nm-thick Co nanowires are composed of hexagonal close-packed and face center cubic Co single crystal segments. Correspondingly, different magnetic properties were revealed in these two types of Co nanowires. The 65 nm-thick Co nanowires have a magnetic hysteresis that is significantly larger than that of the 200 nm-thick Co nanowires. Spontaneous nanowire magnetic moments are parallel to the nanowires in the 65 nm-thick Co nanowires but are transverse to the nanowires in the 200 nm-thick Co nanowires, as observed by the magnetic force microscopy. The correlation between their different magnetic properties and microstructures is discussed. This work was supported by DOE No. DE-FG02-07ER46450, NSF No. DMR-0606529, and the Robert A. Welch Foundation A-0514.

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