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Effects of hydrogen/deuterium absorption on the magnetic properties of Co/Pd multilayers KINESHMA MUNBODH, FELIO PEREZ, CAMERON KEENAN, DAVID LEDERMAN, West Virginia University, MIKHAIL ZHERNENKOV, MICHAEL FITZSIMMONS, Los Alamos National Laboratory —
The effects of hydrogen and deuterium absorption were studied in two Co/Pd multilayers with perpendicular magnetic anisotropy using Polarized Neutron Reflectivity (PNR). PNR measurements were performed with the field in the plane of the sample with the magnetization M saturated at H = 6.0 T and unsaturated at 0.65 T. The nominal thicknesses of the Co/Pd layers were 2.5 Å/21 Å. Therefore, the actual layer chemical composition, thickness, and interface width parameters were defined from the nuclear scattering length density (SLD) profile obtained from both x-ray reflectivity (XRR) and PNR and their derivatives. The nuclear PNR SLD profile showed that although deuterium absorption occurred throughout the sample, the multilayer stack did not expand. The magnetic SLD showed that M in both the Pd and Co layers was affected. At saturation, M decreased, while at H = 0.65 T M increased upon deuterium exposure. Magnetization measurements confirmed hydrogen absorption decreased the total M at saturation and increased the component of M parallel to the field when not at saturation. These results indicate that hydrogen or deuterium absorption decreases both the perpendicular anisotropy and total magnetization of the samples.

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