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Modification of thickness dependent magnetic properties of perpendicular anisotropy Co/Pd multilayer upon hydrogenation

KINESHMA MUNBODH, FELIO PEREZ, DAVID LEDERMAN, West Virginia University — We have studied the change in saturation magnetization ($M_S$) and effective perpendicular anisotropy ($K_{\text{eff}}$) upon hydrogenation at room temperature and a pressure of one atmosphere in $(\text{Co/Pd})_{25}$ multilayers, with Co thickness $\leq 5$ Å and Pd thickness ranging from 0 Å to 25 Å. The change in $M_S$ and $K_{\text{eff}}$ was studied as a function of the x-ray scattering length density profile, generated from the x-ray reflectivity fits. The results show that when the Pd thickness $\leq 10$ Å, the films were highly interdiffused, resulting in no measurable change in $M_S$ and $K_{\text{eff}}$. As the thickness of Pd increases, the contrast between the Co and Pd layers increases, leading to a decrease in $M_S$ and an increase in the component of magnetization in the plane of the samples and hence causing $K_{\text{eff}}$ to decrease. The results clearly demonstrate that the solubility of hydrogen in the multilayer samples decreases with increasing alloying effects as it decreases the vacancy in the Pd 4$d$ band leading to no electronic transfer from the hydrogen atoms to the Pd.

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Prefer Oral Session