フレキシブル基板上 Co 膜の実効磁気弾性結合定数の層構造依存性

Layer structure dependence of effective magnetoelastic coupling constant of Co films deposited on a flexible substrate

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We have demonstrated that a strain application on magnetic metal films deposited on a flexible substrate drastically changes their magnetic anisotropy [1, 2]. A use of the flexible substrate makes it possible to apply a large strain of over 1% without destruction of samples. From the viewpoint of application, both sensitivity and insensitivity of the magnetic properties to external strain are important. The strain sensitive films may be useful for sensing a strain, while the strain insensitive ones are suitable for the devices, in which invariance of their properties under strain is required. Here, we report the magnetoelastic property of Co films sandwiched by non-magnetic underlayer and cap layer.

Ta/X (2 nm)/Co (t_{Co})/Y (2 nm) (denoted as X/Co/Y) layers from the substrate side were deposited on a flexible polyethylene naphthalate substrate by rf sputtering, where t_{Co} = 1-20 nm, and X, Y indicate Cu or Pt. For the details of the strain application and the magnetic anisotropy measurement, see ref. 2. Effective magnetoelastic coupling constants B_{xy} of each film was determined from a change in the magnetic anisotropy energy ΔK under tensile strain ε as $B_{xy} = \Delta K/\varepsilon$. Here, positive B_{xy} means that the magnetic easy axis becomes parallel to the axis of the tensile stress. As shown in Fig., quite different t_{Co} dependences are obtained when the combination of X and Y is changed. The difference in the crystal structure of the Co layer in each structure is expected to be one possible reason for the difference observed here.

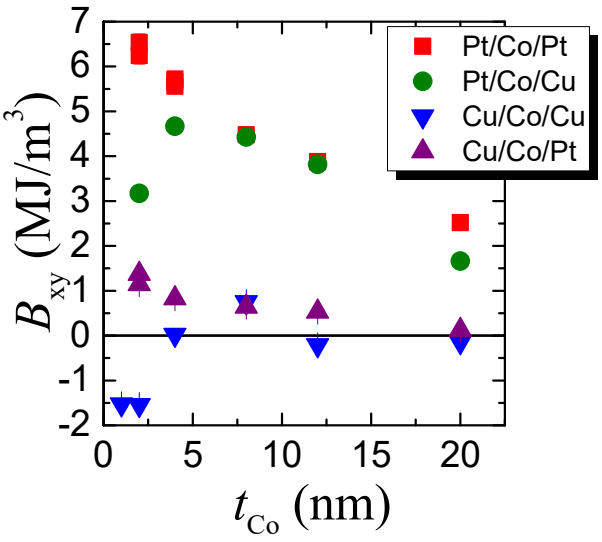

Figure: Co thickness t_{Co} dependence of the effective magnetoelastic coupling constant B_{xy} in various structures.

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[2] R. Asai *et al.*, *J. Appl. Phys.* **120**, 083906 (2016).