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Electric field control of magnetic anisotropy in a Pd/Co/Pt system

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Electric field effect with a capacitor structure has been important method to control magnetic properties in ferromagnetic materials [1,2]. Meanwhile, it has been reported that at the interface between a non-magnetic Palladium (Pd) and a ferromagnetic transition metals, magnetic moment is induced in Pd (ferromagnetic proximity effect) [3]. In this research, we focus on the control of the induced magnetic moment in Pd, using electric field effect.

A Co layer with about monolayer thickness (0.13 nm) was deposited between the Pd (0.86 nm) top layer and the Pt (4.1 nm)/Ta (3.0 nm) under layers. A polymer film containing an ionic liquid, which can form an electric double layer at Pd interface, was put on the sample to apply an electric field to the Pd layer. The figure shows the perpendicular magnetic field dependence of Hall resistance (a) and the normalized in-plane magnetization curve obtained from the Hall measurement (b). Clear difference in the coercivity and the saturation field was observed depending on the value of gate voltage. Most probable reason for this is the induced magnetic moment was modulated due to the modulation of the electron density in the Pd layer because the electric field effect could act on only the surface of the Pd layer.

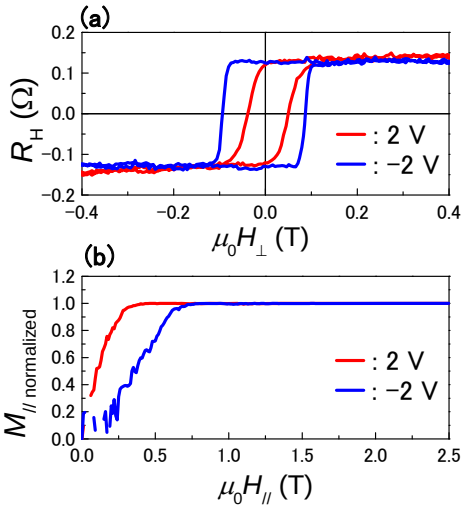

Figure: (a) perpendicular magnetic field dependence of the Hall resistance and (b) in-plane magnetic field dependence of the normalized in-plane magnetization curve measured at 30 K.

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