Electrically controlled magnetism in ferromagnetic Pt

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Electric field modulation of magnetic properties has been attracting attentions because of its fundamental importance for material science as well as potential applications for magnetic recording media. It has been reported that an electric field can change the magnetic anisotropy [1] and the Curie temperature [2] of a ferromagnetic metal. Additionally, proximity-induced ferromagnetism in Pd can be controlled by an electric field [3, 4].

Here, we report an electric field modulation of the ferromagnetism in Pt by X-ray magnetic circular dichroism (XMCD) and absorption spectroscopy (XAS). We used electric-double-layer transistor (EDLT) structure to apply an electric field to the Pd(4 nm)/Co(0.5 nm)/Pt(0.4 nm) channel (Fig. 1) where ferromagnetic order of Pt is induced at the Pt/Co interface. Appreciable changes of the XMCD signal at the L3 of Pt are observed depending on the gate voltage (Fig. 2), indicating that the Pt orbital and spin magnetic moments are changed by applying the electric field. In the presentation, we will discuss detail mechanisms by relating those modulations to changes in the electronic structure.