

Hysteretic magnetoresistance of Pt covered with monolayer Fe-phthalocyanine

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Transition metal phthalocyanine has attracted much attention as a new kind of spintronics material. This is because it may possess a unique magnetism of its metallic ion [1]. Previously, we have reported that Pt/MgO and Pt/Fe-Phthalocyanine (FePc)/MgO multilayers show different magnetoresistance (MR) [2]. In this study, we will report detailed analysis of the MR effect as well as the spin states of FePc revealed by X-ray absorption spectroscopy (XAS).

Figure 1 shows multilayer structure of the device; MgO(001) substrate/MgO(001) (5 nm)/texture-Pt(111) (6 nm)/FePc (0, 0.32 nm)/MgO (2 nm). The multilayer was patterned into rectangular shape ($40 \times 10 \mu\text{m}^2$). 0.32-nm-FePc corresponds to one molecular layer of FePc. Figure 2 shows the device resistance as function of out-of-plane magnetic field (B), where normal MR (proportional to B^2) was subtracted from the raw data. From Fig. 2, there is significant change in MRs between Pt/MgO and Pt/FePc/MgO. Moreover, MR curve of Pt/FePc/MgO shows hysteresis at 2 K. This hysteretic MR effect should originate from magnetic moment direction of Fe-ion in FePc molecules. In the presentation, analysis using Hikami-Larkin-Nagaoka equation [3] and spin states of FePc will be discussed.

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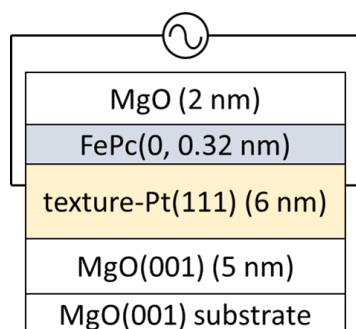


Fig. 1. Sample structure

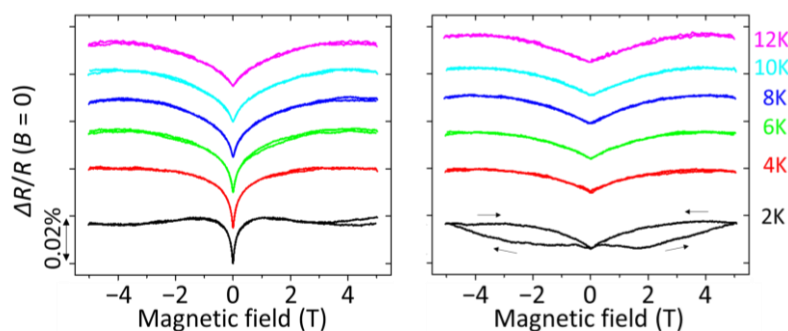


Fig. 2 (a) Pt/MgO

(b) Pt/FePc/MgO

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