

Transport properties in tunnel junction with IrMn ultrathin film

阪大院基礎工 〇後藤 穰、三輪 真嗣、縄岡 孝平、畠中 翔平、水落 憲和、鈴木 義茂

Osaka Univ. 〇Minori Goto, Shinji Miwa, Kohei Nawaoka, Shohei Hatanaka, Norikazu Mizuochi, and

Yoshishige Suzuki

E-mail: goto@spin.mp.es.osaka-u.ac.jp

Ultrathin film of 3d magnetic metal attracts a great attention in spintronics, since its magnetic properties can be controlled by voltage [1-3]. To investigate this, it is important to understand the magnetic properties, such as a magnetic anisotropy and a transition temperature because the magnetic properties in ultrathin films are different from that of bulk. Previously, there have been many investigations in ferromagnetic ultrathin films [1-3]. However, an antiferromagnetic ultrathin film has not been investigated due to the difficulty of experiments. In this study, we attempted to investigate the magnetic properties in antiferromagnetic ultrathin IrMn films by characterizing the tunneling anisotropic magnetoresistance in IrMn/MgO tunnel junctions [4].

Figure 1 shows the schematic of the device configuration and the measurement circuit. The IrMn/MgO tunnel junction with a diameter of 5 μm was fabricated by magnetron sputtering, photo-lithography and Ar ion milling. The resistance was measured between the top and bottom electrode. Figure 2 shows the voltage dependence of the resistance. The local maximum was observed at $V = 0$, which indicates the tunnel transport. We will discuss the magnetotransport properties of ultrathin IrMn film from a temperature and magnetic field dependence of the device resistance.

This work was supported by ImPACT Program of Council for Science, Technology and Innovation.

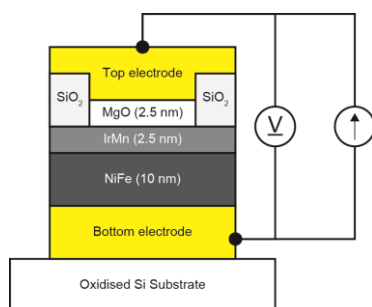


Fig. 1 Device structure and measurement circuit

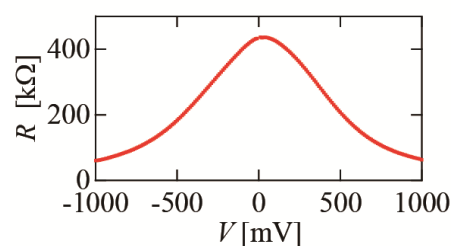


Fig. 2 Resistance of the tunnel junction

- [1] M. Weisheit, *et. al.*, Science, **315**, 349 (2007)
- [2] T. Maruyama, *et. al.*, Nat. Nanotech, **4** 158 (2009)
- [3] D. Chiba, *et. al.*, Nat. Matter, **10**, 853 (2011)
- [4] B. G. Park, *et. al.*, Nat. Matter, **10** 347 (2011)