極性 ZnO 基板上に直接製膜した Co 超薄膜の磁気特性
Magnetic properties of Co ultra-thin film deposited directly on polar ZnO substrates

○千葉 大地[1]，柴田 直哉[2]，塚﨑 敦[3,4]
（1.東大物工，2.東大総合研究機構，3.東北大金研，4.JST さきがけ）
○Daichi Chiba[1], Naoya Shibata[2], Atsushi Tsukazaki[3,4]
(1. DAP, The Univ. of Tokyo, 2. IEI, The Univ. of Tokyo, 3. IMR, Tohoku Univ., 4. PRESTO, JST)
E-mail: dchiba@ap.t.u-tokyo.ac.jp

Magnetic properties of ultra-thin Co films deposited directly on polar ZnO substrate have been investigated. Magnetic anisotropy and Curie temperature T_C of the system were found to be strongly dependent on the polarity of the substrate. It is well known that a gate electric field can change the magnetic properties in the ferromagnetic metals [1-4] through the modulation of carrier density. In our system, the carrier density of the Co near the interfacial surface of ZnO depends on its polarity, *i.e.*, the "built-in backside gate" effect is expected. This effect and structure may give a useful hint to design magnetic properties of the materials as well as offer an ideal system to test the Rashba-related phenomena.

0.4-0.6 nm Co ultra-thin film with 2.4 nm Pt cap layer was deposited on Zn- or O-polar surface of a ZnO (0001) substrates by rf sputtering. The X-ray diffraction experiments showed that the Pt cap layer has fcc(111) texture. Figure 1 shows typical magnetization curves of a simultaneously-deposited pair of samples. Clear perpendicular anisotropy was observed in the samples deposited on O-polar surface, whereas the easy axis of the Zn-polar sample was in-plane. This anisotropy switching was reproduced in more than five pairs of samples. In addition, T_C in Zn-polar ones were always 40-60 K higher than that in O-polar ones. This trend (T_C increases when electron density of the Co layer increases) is consistent with our previous electric field effect experiments [3,4]. Further results of structural investigation and possible mechanism of the anisotropy switching will be discussed.

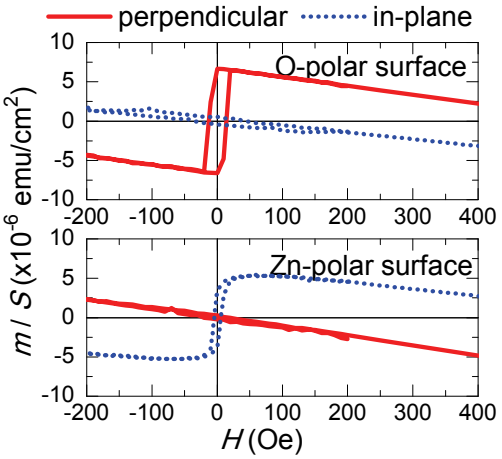

Fig.1 Magnetization curves of the samples.

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