双二次磁気結合の中間層材料依存性
Biquadratic magnetic coupling dependence on material of spacer

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Antiferromagnet is attractive for the high-speed dynamics but it is difficult to observe the current driven oscillation by practical current. We proposed the artificial antiferromagnet consisting of the magnetic domains with antiparallel magnetization alternatively and fabricated it by using the 90 degree magnetic coupling [1]. In simulation, the spin torque oscillation was obtained and the frequency is elevated as increasing the magnitude of 90 degree magnetic coupling [2]. In this study, we performed the higher 90 degree coupling by changing the spacer material.

Figure 1 shows the sample structure and magnetization configuration. The magnetizations of $Co_{90}Fe_{10}$ (A) and $Co_{90}Fe_{10}$ (B) are magnetically coupled in +/−90 degree through the spacer. We used Fe-O, Cr, and Cr-O as the spacer.

Figure 2 shows the magnetization curves for the sample with various spacers, where the coercivity corresponds to the magnitude of 90 degree magnetic coupling. The coercivity strongly depends on the materials and the metallic Cr 1 nm has the highest coercivity, namely 90 degree coupling. The Cr spacer has a good candidate for high frequency in current driven magnetization oscillation.

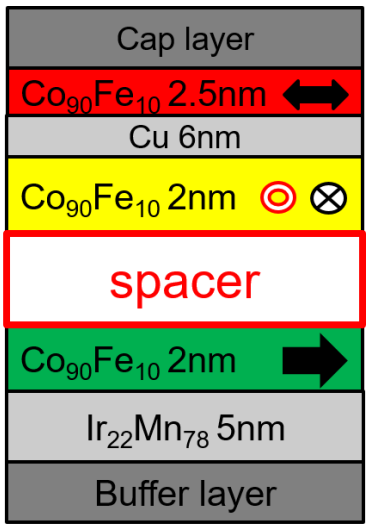

Fig. 1 schematic image of film structure

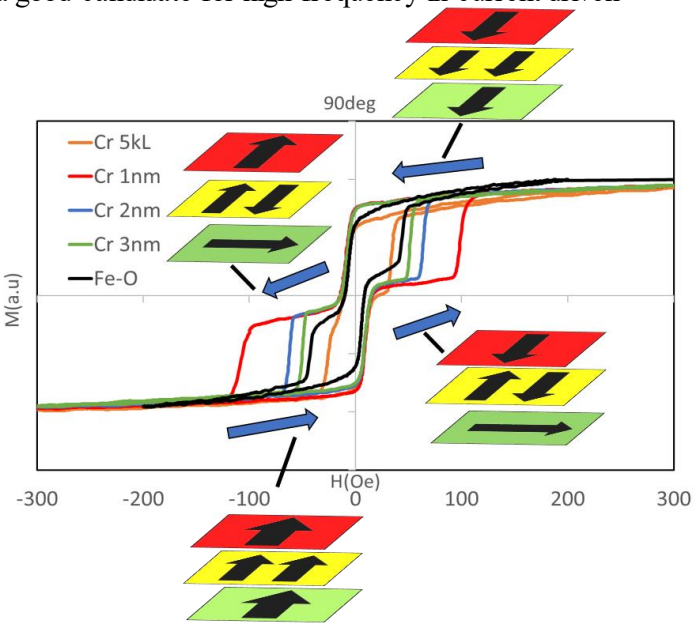

Fig. 2 The MH loop of each material in 90 deg

[1] G. Nagashima., et al, J. Appl. Phys., **126**, 093901 (2019)
[2] S. Horiike., et al., Jpn. J. Appl. Phys., **59**, SGGI02 (2020).

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