Supplementary Material for: "Supercurrent in ferromagnetic Josephson junctions with heavy metal interlayers. II. Canted magnetization"

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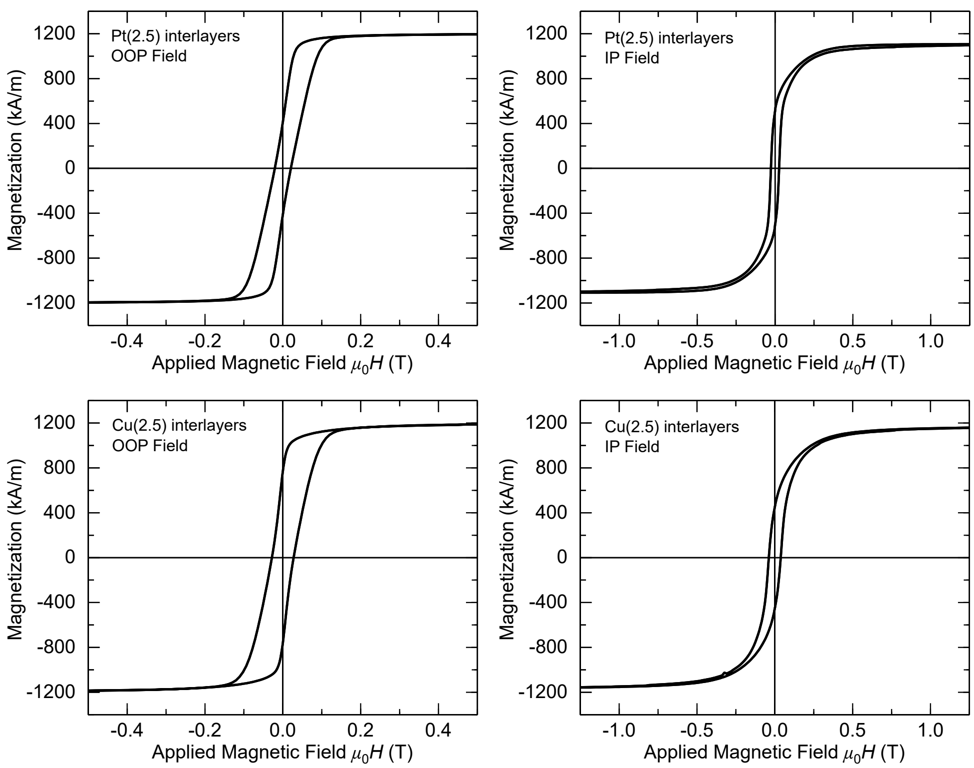

FIG. 1. Magnetic hysteresis loops acquired at a temperature of 10 K for the series S–N–[Co(0.4)/Ni(0.4)]$_{\times 8}$/Co(0.4)–N–S where the interlayer N (either Pt(2.5) or Cu(2.5)) and applied field orientation (either in-plane (IP) or out-of-plane (OOP)) are indicated on the individual loops. The diamagnetic contribution from the substrate has been subtracted. Values of M are calculated from the measured total magnetic moments and areas of the samples, and the total nominal thicknesses of the Co and Ni layers. The uncertainty in M is dominated by the area measurements (different portions of the samples were used for each measurement), and is less than 5%. (1 kA/m = 1 emu/cm^3).

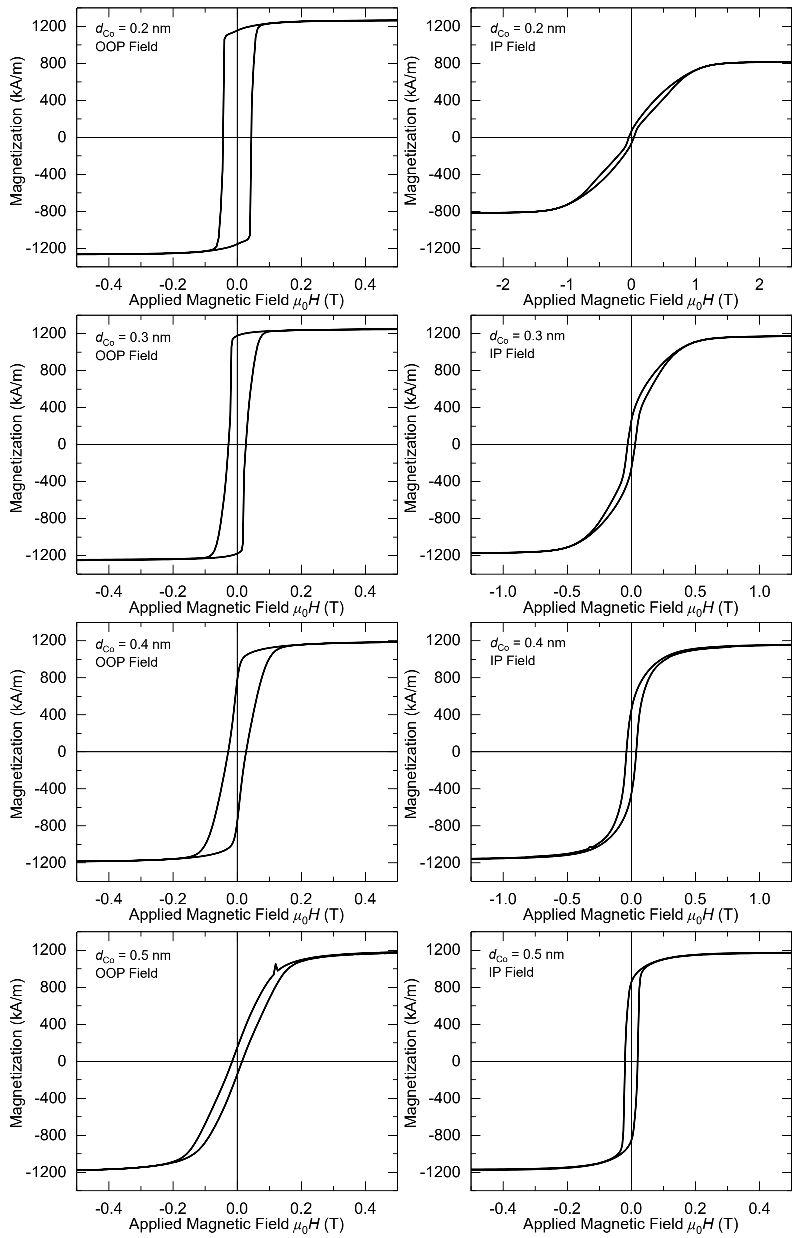

FIG. 2. Magnetic hysteresis loops acquired at a temperature of 10 K for the series S–Cu(2.5)–[Co(d_{Co})/Ni(0.4)]$_{\times 8}$/Co(d_{Co})–Cu(2.5)–S sheet film sample where the thickness of the Co and applied field orientation (either in-plane (IP) or out-of-plane (OOP)) are indicated on the individual loops. The diamagnetic contribution from the substrate has been subtracted. Values of M are calculated from the measured total magnetic moments and areas of the samples, and the total nominal thicknesses of the Co and Ni layers. The uncertainty in M is dominated by the area measurements (different portions of the samples were used for each measurement), and is less than 5%. (1 kA/m = 1 emu/cm^3).

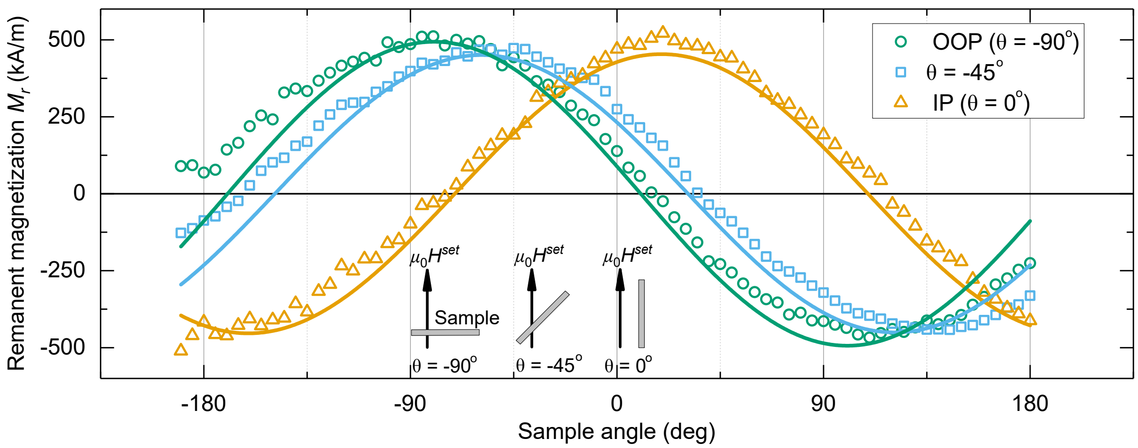

FIG. 3. The zero field remanent magnetization at 10 K for the sample S–Pt(4.5)–[Co(0.4)/Ni(0.4)]$_{\times 8}$/Co(0.4)–Pt(4.5)–S as a function of angle for a set field of 600 mT applied in the same orientations as Figure 1 (a-c) of the main text. The background signal due to the rotator has been subtracted. The lines are fits to a cosine function, $y = A\cos(x - x_c)$ where A and x_c are free fit parameters. The fits are suggestive of a canting away from the direction of applied field by $10^\circ \pm 5^\circ$ from the OOP set field, $15^\circ \pm 5^\circ$ from the 45° set field, and $19^\circ \pm 5^\circ$ from the IP set field. Due to the small portion of the sample used to fit onto the rotator holder and background signal from the rotator, the value of M_r is less reliable than the data in the main text on the same sample, which was acquired using larger portions mounted in low background straws. The manufacturer quoted error in sample angle is 10°, however our own characterization suggests reproducibility of the angle is better than 5°, except at the extreme limits of sample travel. (1 kA/m = 1 emu/cm^3).