

## All-Optical Magnetization Switching in Ferromagnet-Ferrimagnet Coupled Films with Perpendicular Magnetic Anisotropy

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All-optical switching (AOS) of magnetization presents a promising pathway for realizing opto-spintronic applications. Recent studies highlight the potential of integrating AOS with magnetic tunnel junctions (MTJs) for optically-accessible MRAM, in which the data is recorded via AOS in ferrimagnets [1-4]. However, to realize practical memory application, enhanced device performance including tunnel magnetoresistance for data reading, as well as high magnetic anisotropy for data retention, are required. Here, we investigated AOS in ferromagnetic-ferrimagnetic coupled nanostructure MgO(2)/CoFeB(1.2)/Ta(0.6)/Co(1)/Gd(3)/Pt(2) deposited on Si/SiO<sub>2</sub> substrates via a magnetron sputtering [4], where the 0.6-nm-thick Ta spacer is used for the interlayer exchange coupling in the present study. Figure 1 shows the polar magneto-optical Kerr effect (MOKE) loop of the stack at different annealing temperatures. Decent perpendicular magnetic anisotropy (PMA) is achieved at annealing 200°C and 300°C, compatible with MTJ process. Using femtosecond laser pulses, we investigated AOS via Kerr microscopy, as shown in Fig. 2. A signature of complete magnetization reversal under zero magnetic field at a laser fluence of 1.7 mJ/cm<sup>2</sup> is clearly shown. We will present the detailed experimental data in the presentation. This work was supported by KAKENHI (24K21234, 21H05000), MEXT X-NICS (JPJ011438), and Spin-RNJ. K.N and K.I thank to the GP-Spin at Tohoku Univ. K.I thanks to the JSPS fellow.

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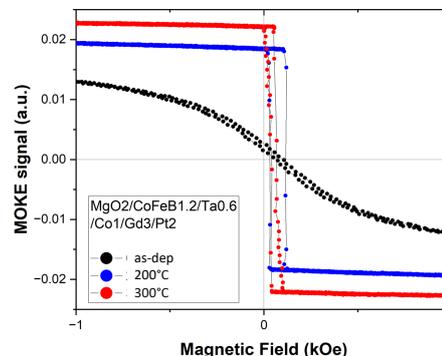


Fig. 1 The polar MOKE loops of the sample annealed at different temperatures. Decent PMA is observed at annealing 200°C and 300°C.

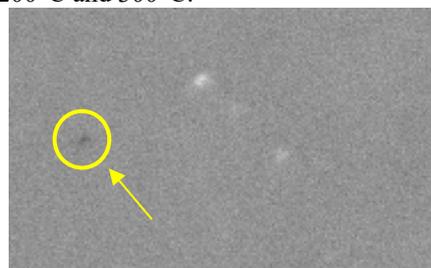


Fig. 2 Demonstration of AOS, observed via the magneto-optical Kerr Microscopy.