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Investigation of magnetic interactions at $Y_3Fe_5O_{12}/Gd_3Ga_5O_{12}$ interface by inserting a diamagnetic $Y_3Sc_2Al_3O_{12}$ buffer layer[1] YANG CHENG, AIDAN LEE, The Ohio State University, MUQING YU, University of Science and Technology of China, JACK BRANGHAM, FENGYUAN YANG, The Ohio State University — $Y_3Fe_5O_{12}$ (YIG) is a well-established material for microwave applications and pure spin transport. $Gd_3Ga_5O_{12}$ (GGG) is a widely used substrate for epitaxial YIG film growth with very small lattice mismatch. Based on our recent study showing enhanced magnetization in YIG films, we suspect the strong Gd moment in GGG may couple to YIG and affect ferromagnetic resonance spin pumping. To probe this effect, we selected a lattice-matched diamagnetic buffer layer, $Y_3Sc_2Al_3O_{12}$ (YSAG), to decouple the potential magnetic interaction between YIG and GGG. Phase-pure YSAG powder, prepared by sol-gel synthesis, was made into a target for epitaxial growth of YSAG films on GGG using off-axis sputtering. X-ray diffraction revealed clear Laue oscillations and a narrow YSAG rocking curve of FWHM 0.0074 degrees, demonstrating high crystalline quality. In addition, the in-plane lattice constant of YSAG films is within 0.1% to those of GGG and YIG, making it an ideal buffer layer for this study. We then grow YIG films on YSAG buffered GGG, which show similarly high crystalline quality and ferromagnetic resonance properties to YIG films on GGG. We will also discuss dynamic spin transport studies using YIG/YSAG/GGG.

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