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Growth and properties of High-quality metal/ yttrium iron garnet/metal sandwich structures¹ MOHAMMED ALDOSARY, JUNXUE LI, CHI TANG, YADONG XU, JING SHI, University of California — Sandwiched structures of magnetic insulators (e.g. yttrium iron garnet or YIG) between two normal metals are potentially useful for spintronics. In this work, we report our approach of growing a single crystalline YIG thin film on a Pt or Cu thin layer using the combination of sputtering and PLD. First, either 5 nm of Pt or Cu is deposited on (110)-oriented gadolinium gallium garnet (GGG) substrate using sputtering and then YIG is grown by PLD at intermediate temperatures followed by rapid thermal annealing at higher temperatures. Surprisingly, YIG films show a well-defined single-crystal reflection high energy electron diffraction (RHEED) pattern, despite that they are grown on polycrystalline Pt or Cu. TEM images show flat, clean and sharp interfaces between YIG/metals and metals/GGG. The magnetic properties show in-plane magnetic anisotropy. However, when thicker metallic layers (20 nm) or amorphous (metals/SiO₂) substrate are used, only YIG polycrystalline phase is observed. We will show that by properly controlling the growth conditions the metal/YIG/ metal structures are not only of high structural quality, but also have desired properties for spin current transport.

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