Annealing temperature dependence of thermo-spin and magneto-thermoelectric conversion in Co_2MnGa films on $Y_3Fe_5O_{12}$ and $Gd_3Ga_5O_{12}$

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Magnetic Heusler alloys have been widely studied as promising spintronic and spin-caloritronic materials because they may show half metallic or topological properties [1]. For instance, Co_2MnGa (CMG), a ferromagnetic full Heusler alloy, with the $L2_1$ ordered phase is known to exhibit the large anomalous Hall and anomalous Nernst effects due to the topological band structure [2,3]. Recent studies show that CMG films with the $L2_1$ and B2 ordered phases also exhibit the large charge-to-spin current conversion efficiency [4,5]. This finding suggests that CMG is useful for inducing thermo-spin effects, such as the spin Seebeck and spin Peltier effects, by forming CMG films on magnetic insulators, *e.g.*, $Y_3Fe_5O_{12}$ [6,7,8,9]. To clarify the potential of CMG as a spin-caloritronic material, in this study, we have characterized the structural and magnetic properties of CMG films grown on $Y_3Fe_5O_{12}$ and $Gd_3Ga_5O_{12}$ substrates at different annealing temperatures. By means of the lock-in thermography technique [9], we have also investigated the thermo-spin and magneto-thermoelectric conversion properties in the CMG/$Y_3Fe_5O_{12}$ and CMG/$Gd_3Ga_5O_{12}$ hybrid systems. In this talk, we will show the details of the experimental results and discuss the origin of the thermo-spin and magneto-thermoelectric conversion properties.

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