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Probing spin polarization in Heusler alloy thin films via point-contact Andreev reflection[1] IPPEI SUZUKI, XIAOHANG ZHANG, TIEREN GAO, ICHIRO TAKEUCHI, Department of Materials Science and Engineering Center for Nanophysics and Advanced Materials, University of Maryland, College Park
— The utilization of the spins of electrons has led to many important device applications. In order to further improve the spin-dependent signals in spintronic devices, incorporating half metals (i.e. materials with a spin polarization of 100%) into current device designs is highly desired. Besides several confirmed examples of half metals, such as CrO_2, mixed-valence manganites, etc., Heusler alloys have also been predicted to exhibit a tunable spin polarization that can reach as high as 100%. In this work, we use a combinatorial fabrication method together with point-contact Andreev reflection (PCAR) measurements to determine the spin polarization in Heusler alloys. Both single-composition Co_2FeAl thin films and composition-spread thin films were fabricated on Si (001) or MgO (001) substrates in a DC magnetron co-sputtering system with a base pressure below $5\times\ 10^{-7}$ Torr. X-ray diffraction measurements indicate that the films are primarily c-axis orientated. In order to suppress the current crowding effect and also increase the junction stability during the PCAR measurements, various buffer layers and/or capping layers were adapted. Further, by using a pre-sharpened Nb tip to complete a superconductor/ferromagnet junction for each sample, a spin polarization in a range of 55%-65% has been obtained at low temperatures.

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