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Growth and characterization of high crystalline quality $Co_2FeAl_xSi_{1-x}$ Heusler alloy films on $MgAl_2O_4(001)$ substrates BRIAN PETERS, Department of Physics, The Ohio State University, CHRISTIAN BLUM, Leibniz Institute for Solid State and Materials Research (IFW), PATRICK WOODWARD[1], The Ohio State University, SABINE WURMEHL, Leibniz Institute for Solid State and Materials Research (IFW), FENGYUAN YANG, Department of Physics, The Ohio State University — A number of Heusler alloys have been predicted to be half-metallic and are thus ideal candidates for use in spintronics. $Co_2FeAl_xSi_{1-x}$ has been predicted and shown to have some of the highest Tc, saturation magnetization and lowest magnetic damping constant among Heusler half-metals. Here we outline the growth and characterization of the highest crystalline quality epitaxial Heusler films using a novel off-axis UHV sputtering technique. We grow these films onto a closely lattice matched $MgAl_2O_4(001)$ substrate, without the need for a Cr-buffer layer or post annealing, as has been done previously. This eliminates the diffusion of Cr across the interface, thus improving the purity and crystallinity of the films at the interface. X-ray diffraction results demonstrate epitaxial films with distinct Laue oscillations and rocking curves of FWHM as low as 0.0035°, which demonstrates the highest crystalline quality for Heusler films reported to date. Magnetic measurements show highly square hysteresis loops with a remanence of 95-98%, near ideal saturation magnetization, very small coercivities - between 3-8 Oe, pronounced magnetocrystalline anisotropy.

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