Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Probing antiferromagnetism in NiMn/Ni/(Co)/Cu_3Au(001) single-crystalline epitaxial thin films M. YAQOOB KHAN, CHII-BIN WU, WOLFGANG KUCH, Freie Universität, Institut für Experimentalphysik, D-14195 Berlin, Germany — Antiferromagnetism of equi-atomic single-crystalline NiMn thin film alloys grown on Ni/Cu_3Au(001) is probed by means of magneto-optical Kerr effect (MOKE). Thickness-dependent coercivity enhancement of NiMn/Ni/Cu_3Au(001) showed that 7 atomic monolayers (ML) NiMn order antiferromagnetically at room temperature. It is found that NiMn can couple to out-of-plane (OoP) as well as in-plane (IP) magnetized Ni, the latter stabilized by Co under-layer deposition. The antiferromagnetic (AFM) ordering temperature (T_{AFM}) of NiMn coupled to OoP Ni is found to be much higher (up to 110 K) than in the IP case, for otherwise identical interfacial conditions. This is attributed to the 'magnetic proximity effect' in which the ferromagnetic (FM) layer substantially influences the T_{AFM} of the adjacent AFM layer and can be explained by either (i) a higher interfacial coupling strength or/and (ii) more thermally stable NiMn distorted spin structure when coupled to Ni magnetized in OoP direction than in IP. An exchange-bias effect could only be observed for the thickest NiMn film studied (35.7 ML); the exchange-bias field is higher in the OoP exchange-coupled system than in the IP one due to the same reason/s.

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Date submitted: 06 Dec 2011 Electronic form version 1.4