

Neutron scattering from the spin-density-wave magnetism in itinerant antiferromagnetic Cr/Cr-Mn superlattices

Eric E. Fullerton, IBM Almaden Research Center, K63/E3, 650 Harry Rd., San Jose, CA 95120, C. H. Sowers and S. D. Bader, Argonne National Laboratory, Argonne, IL 60439, and J. L. Robertson, Oak Ridge National Laboratory, Oak Ridge, TN 37831.

The role of interfacial exchange coupling on the magnetic ordering of antiferromagnetic (AF) superlattices is an area of ongoing research. However, previous results were on AF insulators with local moments [1,2]. We extend these studies to itinerant AF Cr/Cr-Mn(001) superlattices grown by magnetron sputtering onto MgO(001) substrates.. Bulk Cr is an itinerant AF which forms an incommensurate spin density wave (SDW) below the Neel temperature (T_N) of 311 K. The Cr-Mn layers were doped with 2.5 at. % Mn to enhance T_N (about 800 K for our films) and stabilize commensurate AF order. The Cr-Mn layers were fixed at 3 nm and the Cr layers were varied from 6.3 to 20 nm. The magnetic ordering was determined by neutron scattering. We find that the Cr ordering is strongly perturbed by the presence of the Cr-Mn layers. Incommensurate SDW order is observed in the Cr layers for $T < 275$ K with a SDW period close to that observed for bulk Cr. For $T > 275$ K we observe commensurate AF ordering of the Cr layers which persists to at least twice the bulk Cr ordering temperature. We compare the present results to the previous insulator studies and to neutron scattering results of Fe/Cr(001) superlattices [3].

Work supported U.S. DOE contract No. W-31-109-ENG-38 at ANL and DE-AC05-84OR21400 at ORNL.

[1]. C. A. Ramos *et al.*, Phys. Rev. Lett. **65**, 2913 (1990).

[2]. E. N. Abarra *et al.*, Phys. Rev. Lett. **77**, 3451 (1996).

[3]. E. E. Fullerton *et al.*, Phys. Rev. Lett. **77**, 3451 (1996).