Abstract for an Invited Paper
for the MAR09 Meeting of
The American Physical Society

Neutron and X-Ray Scattering Studies of the Exchange Bias Problem

SUNIL K. SINHA, Department of Physics, University of California, San Diego

Exchange Bias, i.e. the shift of the hysteresis loop of a ferromagnet in juxtaposition to an antiferromagnet, is a phenomenon that has been known for fifty years, and has already been put to wide commercial use in devices such as magnetic read-heads and other devices. Nevertheless a detailed understanding of the effect has proved to be fairly controversial, notwithstanding much research on this problem over the years, and the development of several alternative theoretical models. This is partly due to the necessity of understanding the details of the interactions and the magnetic structure across and in the vicinity of the interface between the ferromagnet and the antiferromagnet. The details of how interface roughness and other defects affect exchange bias and the details of how magnetic domains are established on both sides of the interface are still not well understood. Non-destructive probing of such buried interfaces is conveniently accomplished with neutron scattering or synchrotron X-ray techniques such as X-Ray Magnetic Circular Dichroism, Photoemission imaging or Resonant Magnetic X-ray Scattering, and these types of experiments have been increasingly employed over the last decade. We shall attempt to discuss what has been learned from such experiments and what crucial issues remain unresolved, with particular emphasis on recent studies of the Co/FeF_2 and Permalloy/CoO exchange bias bilayer systems.