Materials Research Science and Engineering Center
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Summer 2000 Team

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Fe Magnetic Films on Mg0 (100) Substrates

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In the past, the coupling, or exchange bias, between thin ferromagnetic (FM) and antiferromagnetic (AFM) films, vital e.g. for magnetic RAM and magnetic sensors, has been investigated. However, recent studies using the anisotropical magnetoresistence (AMR) method have resulted in values substantially larger than those obtained with other techniques. This discrepancy will be studied on the simple systems Fe/FeO, Co/CoO, and Ni/NiO, where the oxide is the AFM layer, to gain a better understanding of the microscopic origin of the coupling. The samples will be prepared by sputtering the pure metal on MgO substrates of different orientations ((001), (110), (111)) and subsequent exposure to oxygen. The accurate exchange bias will be measured using AMR; vibration sample magnetometry measurements will recreate previous results. The dependence of the coupling on the crystalline structure (polycrystalline vs. single crystal) and orientation will also be studied, using X-ray diffraction, atomic force microscopy and He scattering.