Hybrid Magnetic Heterostructures

Ivan K. Schuller
Physics Department, UCSD, La Jolla, California 92093, USA

Hybrid materials allow the engineering of new material properties by creative uses of proximity effects. When two dissimilar materials are in close physical proximity the properties of each one may be radically modified or occasionally a completely new material emerges. In the area of magnetism, controlling the magnetic properties of ferromagnetic thin films without magnetic fields is an on- going challenge with multiple technological implications for low- energy consumption memory and logic devices. Interesting possibilities include ferromagnets in proximity to dissimilar materials such as antiferromagnets or oxides that undergo metal-insulator transitions. The proximity of ferromagnets to antiferromagnets has given rise to the extensively studied Exchange Bias [1]. Our recent investigations in this field have addressed crucial issues regarding the importance of the antiferromagnetic [2-3] and ferromagnetic [4] bulk for the Exchange Bias and the unusual short time dynamics [5-6].

If time permits I will describe a series of recent studies in which we have investigated the magnetic properties of different hybrids of ferromagnets (Ni, Co and Fe) and oxides, which undergo metal-insulator and structural phase transitions. Both the static as well as dynamical properties of the ferromagnets are drastically affected. Static properties [7-8] such as the coercivity, anisotropy and magnetization and dynamical [9] properties such as the microwave response are clearly modified by the proximity effect and give raise to interesting, perhaps useful, properties.

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