Departamento de Física de Materiales

SEMINARIO

Controlling magnetic properties in hybrid materials

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SALA DE SEMINARIOS
DEPARTAMENTO DE FÍSICA DE MATERIALES
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The transfer of electronic, magnetic, and structural properties from one material into another when in direct proximity can induce novel functionalities in hybrid materials. The proximity effects are enhanced when different length or time scales are competing in each material. Interesting possibilities arise when ferromagnets are in proximity to materials that undergo a structural phase transition (SPT) and metal to insulator transition (MIT).

Canonical examples of materials that undergo a SPT are the vanadium oxides (VO_2 and V_2O_3). VO_2 undergoes a metal/rutile to an insulator/monoclinic phase transition at 340 K. In V_2O_3 the transition at 160 K is from a metallic/ rhombohedral to an insulating/monoclinic phase. We have investigated the magnetic properties of different combinations of ferromagnetic metals and vanadium oxide thin films.

In a first example, I will show that stress and phase coexistence associated with the first order structural transition produce large changes in the properties of magnetic films in the proximity of the oxides. In a second example I will show that the creation of a Fe_3O_4 interface in Permalloy ($Ni_{80}Fe_{20}$) / V_2O_3 bilayers gives rise to exchange bias and a vertical shift in the magnetization. Both effects are due to the change in the easy axis of the magnetization across the Fe_3O_4 Verwey transition.