Title: Study of proximity effect in YBCO/FePd heterostructures

Abstract:

The generation of domain-wall superconductivity and spin-triplet Cooper pairs in ferromagnets with large penetration depths will play an important role in the development of spintronic devices. In the heterostructures of multilayer films, the proximity effect is closely related to the interfacial electronic states. The multilayer structure FePd/$YBa_2Cu_3O_{7-x}$, where FePd and YBCO, have similar lattice parameters provides a new and unique system for exploring proximity effects.

In this study, $YBa_2Cu_3O_{7-x}$/FePd (HTS/F) heterostructures were prepared using HOPS and OMBE techniques and the properties of magnetization and electron transport of this sample were measured to verify the presence of proximity effects. Due, in part, to the spiral growth nature of YBCO, and the restrictions on the growth parameters of FePd, the FePd deposited on YBCO tends to be polycrystalline and SQUID measurements show the easy-axis of magnetization is in the in-plane direction. In the R-H curves, the samples of the HTS/F group exhibit a very different trend change from that of the pure HTS sample: a sharp peak in resistance appears near the coercive field close to the ferromagnetic film, in the negative and positive field sweeps. These peaks are only observed when the magnetic field is applied in the in-plane direction.

In the colloquium, I will explain the basics of the proximity effect and compare and demonstrate the electron transport properties of the HTS/F group and the pure HTS group, discussing the possible reasons for the phenomenon that produces the peaks in resistance in the HTS/F heterostructure.