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Interface magnetism in complex oxide heterostructures[1]

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Magnetic oxides are an important class of materials from the perspectives of fundamental physics and technological applications. Advances in growth of high quality thin films and epitaxial oxide heterostructures over the years, have led to the realization of ideal condensed matter systems in which the complex and rich physics associated with cooperative phenomena can be explored. Examples of coupled phenomena in heterostructures include exchange bias effects, magnetoelectric coupling and interplay between magnetism and superconductivity. In this talk, I will focus on three classes of oxide heterostructures –PLD-grown M-type barium hexaferrite(BaM)/barium strontium titanate(BST), CVD-grown CrO_2/Cr_2O_3 bilayers and high-pressure sputtered LCMO/YBCO films. The common theme is the magnetic coupling across the interfaces. I will demonstrate that dynamic susceptibility and kinetic inductance experiments using a sensitive tunnel-diode oscillator (TDO) are effective probes of such coupled effects. In the case of CrO_2/Cr_2O_3 and LCMO/YBCO, the interface coupling results in anomalous anisotropy, exchange bias in the former and complex interaction between the LCMO magnetism and YBCO vortex lattice in the latter. In BaM/BST heterostructures, I will discuss how interfacial coupling influences the microwave response that is both electrically and magnetically tunable.

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