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Engineering the ferroic orders at $BiFeO_3/La_{0.67}Sr_{0.33}MnO_3$ interfaces ER-JIA GUO, Oak Ridge National Laboratory, JONATHAN PETRIE, PG Research, MANUEL ROLDAN, KAUST, QIAN LI, RYAN DESAUTELS, TIMOTHY CHARLTON, ANDREAS HERKLOTZ, JOHN NICHOLS, Oak Ridge National Laboratory, JOHN FREELAND, Argonne National Laboratory, SERGEI KALININ, HO NYUNG LEE, Oak Ridge National Laboratory, MICHAEL FITZSIMMONS, Argonne National Laboratory — Artificially engineered heterostructures enable new functionalities that cannot be realized from the individual constituents. Utilizing the external stimulations, like strain and electrostatic doping, gives a good handle to investigate the ferro-orders in multiferroic hybrids. In this talk, we first show the ferroelectric switching dynamics of $BiFeO_3$ (BFO) capacitors can be effectively controlled by applying in-situ reversible controlled strain through a piezoelectric substrate. The domain dynamics under different strain states are studied using a piezoresponse force microscopy (PFM). The velocity of ferroelastic domain walls can be reversibly changed by more than one order of magnitude through simply modulating the strain of the order of ˜0.1%. In the second part of the talk, we will report a ferromagnetic state is observed in the entire BFO layers, sandwiched between two manganite layers. While the BFO ultrathin layers maintain a good ferroelectric property, both polarized neutron reflectometry and x-ray magnetic circular dichroism reveal that the spin state of BFO is anti-parallel to the magnetization of LSMO. We attribute the novel ferromagnetic state of BFO is related to the electronic orbital reconstruction at the interfaces.

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