Voltage control of magnetism in $La_{0.67}Sr_{0.33}MnO_3$/PMN-PT heterostructures

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The demand for energy-efficient devices for future technological applications is driving research in the field of “voltage control of magnetism”. New developments in oxide heterostructures offer great promise for improvements in magnetic data storage, spintronics and high frequency magnetic devices. Most current information storage devices require high current densities to read or write information in the form of local variations in magnetization [1]. Since correlated complex oxides possess strong coupling between lattice, charge, spin and orbital degrees of freedom, they offer the prospect of device concepts based on magnetoelectric (ME) coupling [2]. Here, we report on the growth and characterization of epitaxial multiferroic ferromagnetic/ (ferroelectric, piezoelectric) heterostructures of $La_{0.67}Sr_{0.33}MnO_3$/0.7($Pb(Mg_{1/3}Nb_{2/3})O_3$)-0.3($PbTiO_3$)(001): LSMO/PMN-PT(001). Measurements of magnetization, which are performed using SQUID-VSM, reveal ME coupling when a voltage is applied between the layers. Magnetic depth profiles of the heterostructures are obtained using polarized neutron reflectometry, while structural characterization of interfacial morphology is performed using transmission electron microscopy.

References

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