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Magnetic tunnel junctions with a ferroelectric barrier using epitaxial $La_{0.7}Ca_{0.3}MnO_3$/(Ba, Sr)TiO_3/$La_{0.7}Ca_{0.3}MnO_3$trilayers[1] SHENG-MING GUO, KE CHEN, XIAOXING XI, QI LI, Pennsylvania State University, YONGGANG ZHAO, Tsinghua University — We have fabricated multiferroic tunnel junctions using ferromagnetic $La_{0.7}Ca_{0.3}MnO_3$as electrodes and ferroelectric (Ba, Sr)TiO_3 as the barrier. We have observed tunneling magnetoresistance as in a typical magnetic tunnel junction (MTJ). Since the ferroelectric barrier can be charge polarized in two opposite directions which alters tunneling conductance, we have observed large tunneling electroresistance ($\sim 50\%$) when the charge polarization is switched. This has been observed for both magnetic parallel and antiparallel states. As a result, this type of junctions has four resistance states instead of two for a normal MTJ, corresponding to positive- and negative-polarized parallel and antiparallel states. The four states can be manipulated by the magnetic and electric fields. The dependence of the magnetoresistance and electroresistance as functions of magnetic field, electrical field, and bias voltage will be presented.

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