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Four state ferroelectric memory devices at room temperature

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We report the four step ferroelectric polarization switching in BiFeO3(BFO)/SrRuO3 (SRO)/BiMnO3(BMO) heterostructure thin films. All crystalline films are grown on (100) oriented Niobium doped SrTiO3 (NSTO) single crystal substrates by pulsed laser deposition. We found a novel four step ferroelectric polarization switching dynamics that clearly differs from that of individual layers. The binary states of ferroelectric polarization in ferroelectrics are considered for digital data storage applications. Multiple energy states of ferroelectric polarization are essential to shrinking the dimension down of the memory devices. No clear experimental evidences have been reported until now towards multi state ferroelectric polarization switching in multiferroic perovskites at room temperature. Our results show a promising device concept that can enhance the data storage capacity in heterostucture capacitor devices.

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