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Photo-induced stabilization and enhancement of the ferroelectric polarization in $Ba_{0.1}Sr_{0.9}TiO_3/La_{0.7}Ca(Sr)_{0.3}MnO_3$ thin film heterostructures[1] Y.M. SHEU, S.A. TRUGMAN, L. YAN, Q.X. JIA, A.J. TAYLOR, R.P. PRASANKUMAR, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA — We demonstrate that optically pumping carriers across the interface between ferroelectric $Ba_{0.1}Sr_{0.9}TiO_3$ and ferromagnetic $La_{0.7}Ca(Sr)_{0.3}MnO_3$ thin films can not only stabilize but also enhance ("write") the remanent polarization, which breaks crystal inversion symmetry, generating an optical second-harmonic signal that we "read." The new photo-induced ("written") ferroelectric state remains stable at low temperatures for over one day after removing the laser pulse. By optically decoupling the energy of the internal electric field from the ferroelectric double potential wells, we show that the displacement of the Ti atom increases, leading to a larger, more stable polarization state that may be suitable for applications in data storage (using similar writing and reading processes) as well as energy storage (e.g., solar nanocapacitors).

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