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GaMnAs-based hybrid multiferroic memory device . M. OVERBY, A. CHERNYSHOV, L.P. ROKHINSON, Department of Physics, Purdue University, West Lafayette, IN 47907 , J.K. FURDYNA, X. LIU, Department of Physics, University of Notre Dame, Notre Dame, IN 46556 — In a ferromagnetic semiconductor GaMnAs grown on GaAs there are two equivalent easy axes of magnetization along the [100] and [010] crystallographic directions. These two directions can form a basis for a memory device with the binary state being encoded in the direction of the magnetization. The state can be electrostatically controlled by introducing a compressive (tensile) strain along one of the easy axes. We demonstrate a novel non-volatile hybrid multiferroic memory cell with electrostatic control of magnetization based on strain-coupled GaMnAs and a piezoelectric material. The magnetization direction is monitored via planar Hall effect, which changes sign when magnetization rotates. At zero voltage on the piezoelectric magnetization can be oriented either along [100] or [010], when voltage on piezoelectric is swept between positive and negative values magnetization forms a hysteresis loop with abrupt transitions between the two orientations.

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