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GaMnAs-based hybrid multiferroic memory device

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A rapidly developing field of spintronics is based on the premise that substituting charge with spin as a carrier of information can lead to new devices with lower power consumption, non-volatility and high operational speed. Despite efficient magnetization detection, magnetization manipulation is primarily performed by current-generated local magnetic fields and is very inefficient. Here we report a novel non-volatile hybrid multiferroic memory cell with electrostatic control of magnetization based on strain-coupled GaMnAs ferromagnetic semiconductor and a piezoelectric material. We use the crystalline anisotropy of GaMnAs to store information in the orientation of the magnetization along one of the two easy axes, which is monitored via transverse anisotropic magnetoresistance. The magnetization orientation is switched by applying voltage to the piezoelectric material and tuning magnetic anisotropy of GaMnAs via the resulting stress field.