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Complete demagnetization of (Ga,Mn)As films via electric field HAILONG WANG, JIANHUA ZHAO, Institute of Semiconductors, Chinese Academy of Sciences — Electric field (E-field) control of magnetism is promising for decreasing the power consumption of information processing and storage. So far, E-field manipulation of magnetism such as Curie temperature (Tc) and coercivity has been reported. However, the electric field effects on magnetism are usually very small, and the previous results are often observed near Tc. In this work, we first demonstrate the complete demagnetization of a ferromagnet via E-field. Considering the limited charge modulation ability of E-field restricted by the breakdown voltage of dielectrics, (Ga,Mn)As films featuring lower carrier concentration than ferromagnetic metals were utilized here. Ultrathin (Ga,Mn)As films (˜2 nm) showing well defined ferromagnetism were successfully fabricated by low-temperature molecular-beam epitaxy. This was achieved by combining heavily Mn doping and post-growth annealing. More importantly, a p-type GaAs buffer was critical to maintain the ferromagnetism of ultrathin (Ga,Mn)As by avoiding partial depletion of holes near the interface. Then ionic liquid or solid state ionic gel were used to produce huge interfacial E-field, and giant modulation of magnetism including complete demagnetization was realized.

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