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Composition and temperature dependences of electric-field control of nonvolatile magnetization in Co40Fe40B20/Pb(Mg1/3Nb2/3)(1-x)TixO3 multiferroic heterostructures YAN LIU, YONG ZHAO, PEI LI, SEN ZHANG, Department of physics, Tsinghua University, DA LI, HAO WU, XIU HAN, Beijing National Laboratory for Condensed Matter Physics , Chinese Academy of Sciences — Recently, a large and nonvolatile bipolar-electric-field-controlled magnetization at room temperature (RT) was demonstrated in Co40Fe40B20/Pb(Mg1/3Nb2/3)0.7Ti0.3O3 structure, in which Pb(Mg1/3Nb2/3)0.7Ti0.3O3 is in the morphotropic phase boundaries (MPB) region. It is well-known that ferroelectrics with MPB can display excellent electromechanical properties. In order to investigate whether the MPB is important for the large nonvolatile behavior, we studied the electric-field-controlled magnetization in Co40Fe40B20/ Pb(Mg1/3Nb2/3)(1-x)TixO3 (x=0.17, x=0.30, x=0.34, x=0.38) heterostructures, of which Pb(Mg1/3Nb2/3)(1-x)TixO3 structure varies with increasing x from rhombohedral (R) phase, MPB, to tetragonal phase5. We found that the samples with Pb(Mg1/3Nb2/3)(1-x) TixO3 in R phase and MPB both display large and nonvolatile behavior, while it shows volatile behavior in tetragonal phase. These results indicate that it is not MPB but R phase that is vital for the nonvolatile behavior. We also studied the temperature effect of electric-field-controlled magnetization by varying temperatures from 200 K to 340 K, and found that the modulation display different behavior with varying temperature, which can be explained by the phase changes in Pb(Mg1/3Nb2/3)(1-x)TixO3.

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