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Interface induced giant magnetoelectric coupling in multiferroelectric superlattices HONGWEI WANG[1], LIXIN HE[2], Key Laboratory of Quantum Information, University of Science and Technology of China,, XIFAN WU[3], Department of Physics and Institute for Computational Molecular Science, — $AMnO_3$ (A=Ca, Sr, ...) are good candidates as building blocks for the multiferroic supperlattices, because they have several competing instabilities coupled to the magnetic ordering. The coupling between the spin, the AFD modes and the FE modes depends on the relative energetics of these instabilities. Unfortunately in bulk AMnO3, there is a strong AFD instability associated with a large oxygen octahedral rotation that suppresses the FE mode. As a result, the linear magnetoelectric (spin-ferroelectricity) coupling is usually found to be weak. We take the $CaMnO_3$(CMO)/$BaTiO_3$(BTO) SLs as our model systems. We find that the MnO_6 octahedral rotation will be strongly suppressed by the neighboring BaO layers, leading to the enormous enhancement of magnetoelectric coupling and the local electric polarizations in the CMO layers are significant, comparable to that in the BTO layers. This enhancement will be strengthened with the increasing density of interfaces and reaches its maximum at the shortest SL, (i.e., n=1) where one observes a huge change of electric polarization between the antiferromagnetic (AFM) and ferromagnetic (FM) states.

[1]Hefei, Anhui, 230026, People's Republic of China
[2]Hefei, Anhui, 230026, People's Republic of China
[3]Temple University, Philadelphia, PA 19122, USA

Hongwei Wang
Key Laboratory of Quantum Information,
University of Science and Technology of China

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