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Electric field control of nonvolatile four-state magnetization at room temperature SAE HWAN CHUN*, YI SHENG CHAI*, BYUNG-GU JEON, HYUNG JOON KIM, YOON SEOK OH, INGYU KIM, HANBIT KIM, BYEONG JO JEON, SO YOUNG HAAM, JU-YOUNG PARK, SUK HO LEE, KEE HOON KIM, CeNSCMR, Department of Physics and Astronomy, Seoul National University, Seoul 151-747, Korea, JAE-HO CHUNG, Department of Physics, Korea University, Seoul 136-713, Korea, JAE-HOON PARK, Department of Physics and Division of Advanced Materials Science, POSTECH, Pohang 790-784, Korea — We find the realization of large converse magnetoelectric (ME) effects at room temperature in a multiferroic hexaferrite $Ba_{0.52}Sr_{2.48}Co_2Fe_{24}O_{41}$ single crystal, in which rapid change of electric polarization in low magnetic fields (about 5 mT) is coined to a large ME susceptibility of 3200 ps/m. The modulation of magnetization then reaches up to 0.62 μ_B/f.u. in an electric field of 1.14 MV/m. We find further that four ME states induced by different ME poling exhibit unique, nonvolatile magnetization versus electric field curves, which can be described by an effective free energy with a distinct set of ME coefficients. *These authors contributed equally to this work.

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