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Room temperature electric-field control of magnetism in layered oxides with cation order XUEZENG LU, JAMES M. RONDINELLI, Northwestern Univ, MATERIALS THEORY AND DESIGN GROUP TEAM — Searching for materials with room-temperature electric-field control of magnetism has interested researchers for many years with three-dimensional perovskite BiFeO3-based compounds as the main focus. Here we choose the layered hybrid improper ferroelectric Ruddlesden-Popper oxides as a platform from which to realize electric field controllable magnetism, leveraging a recently identified strain tunable polar-to-nonpolar (P-NP) transition. We first propose a design principle for selecting the required A and B cation chemistries that ensure strained A3B2O7 (001) –oriented films exhibit the P-NP transitions, which we substantiate with density functional calculations. We next extend our guideline to B-site ordered A3BB′O7 oxides to expand the number of available compounds exhibiting P-NP transitions. We then demonstrate electric-field controllable weak ferromagnetism at the boundary of the P-NP transition in magnetic (001) A3BB′O7 films and propose new compounds for route to room temperature magnetoelectric multiferroics.

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