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Designing asymmetric multiferroics with strong magnetoelectric coupling XUEZENG LU, Northwestern University, HONGJUN XIANG, Fudan University, JAMES RONDINELLI, Northwestern University, MATERIALS THEORY AND DESIGN GROUP TEAM — Multiferroics offer exciting opportunities for electric-field control of magnetism. Single-phase multiferroics suitable for such applications at room temperature need much more study. Here, we propose the concept of an alternative type of multiferroics, namely, the "asymmetric multiferroic." In asymmetric multiferroics, two locally stable ferroelectric states are not symmetrically equivalent, leading to different magnetic properties between these two states. Furthermore, we predict from first principles that a Fe-Cr-Mo superlattice with the LiNbO3-type structure is such an asymmetric multiferroic. The strong ferrimagnetism, high ferroelectric polarization, and significant dependence of the magnetic transition temperature on polarization make this asymmetric multiferroic an ideal candidate for realizing electric-field control of magnetism at room temperature. Our study suggests that the asymmetric multiferroic may provide an alternative playground for voltage control of magnetism and find its applications in spintronics and quantum computing.

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