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Predicting a Ferrimagnetic-Ferroelectric Phase of Zn_2FeOsO_6 with Strong Magnetoelectric Coupling HONGJUN XIANG, P.S. WANG, Fudan University, WEI REN, Shanghai University, L. BELLAICHE, University of Arkansas — Multiferroic materials, in which ferroelectric and magnetic ordering coexist, are of fundamental interest for the development of novel memory devices that allow for electrical writing and non-destructive magnetic readout operation. The great challenge is to create room temperature multiferroic materials with strongly coupled ferroelectric and ferromagnetic (or ferrimagnetic) orderings. $BiFeO_3$ has been the most heavily investigated single-phase multiferroic to date due to the coexistence of its magnetic order and ferroelectric order at room temperature. However, there is no net magnetic moment in the cycloidal (antiferromagnetic-like) magnetic state of bulk $BiFeO_3$, which severely limits its realistic applications in electric field controlled spintronic devices. Here, we predict that double perovskite Zn_2FeOsO_6 is a new multiferroic with properties superior to $BiFeO_3$. First, there are strong ferroelectricity and strong ferrimagnetism at room temperature in Zn_2FeOsO_6. Second, the easy-plane of the spontaneous magnetization can be switched by an external electric field, evidencing the strong magnetoelectric coupling existing in this system. Our results suggest that ferrimagnetic 3d-5d double perovskite may therefore be used to achieve voltage control of magnetism in future spintronic devices.

[1] P. S. Wang *et al.*, arXiv:1409.8430 (2014).

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