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Magnetic charge and magnetoelectricity in hexagonal manganites and ferrites[1] MENG YE, DAVID VANDERBILT, Rutgers Univ — Magnetoelectric (ME) materials are of fundamental interest and are investigated for their broad potential for technological applications. Commonly the dominant contribution to the ME response is the lattice-mediated one, which is proportional to both the Born electric charge Z^{e} and its analogue, the dynamical magnetic charge Z^{m}.[2] A previous study has shown that exchange striction acting on noncollinear spins induces much larger magnetic charges than when Z^{m} is driven by spin-orbit coupling.[3] The hexagonal manganites $R\mathrm{MnO_3}$ and ferrites $R\mathrm{FeO_3}$ (R=Sc, Y, In, Ho-Lu) exhibit strong couplings between electric, magnetic and structural degrees of freedom, with the transition-metal ions in the basal plane are antiferromagnetically coupled through super-exchange so as to form a 120° spin arrangement. Here we present a theoretical study of the magnetic charges, and of the spin-lattice and spin-electronic ME constants, in these hexagonal manganites and ferrites, clarifying the conditions under which exchange striction leads to enhanced Z^{m}s and anomalously large in-plane spin-lattice ME effects.

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[2]J. Íñiguez, Phys. Rev. Lett. **101**,117201 (2008).
[3]M. Ye and D. Vanderbilt, Phys. Rev. B **89**, 064301 (2014).

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