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A simple model for the magnetoelectric interaction in multiferroics[1] C.J. CALDERON, G.E. BARBERIS, Instituto de Física Gleb Wataghin, UNICAMP, Campinas (SP) Brazil — The (anti)ferromagnetic and ferroelectric transitions in some magnetoelectric compounds seem to be strongly correlated. Even for systems that do not show spontaneous ferroelectricity such as the $LiMPO_4$ (M = Mn, Fe, Co, Ni) compounds, the coupling between magnetic and electric degrees of freedom is evident experimentally. Here, we present a simple numerical calculation to simulate this coupling that leads to the two transitions. We assume a magnetic sublattice consisting of magnetic moments coupled to a separated non-magnetic sublattice consisting of classical electric dipoles. The coupling between them is realized using the phenomenological spin - lattice Hamiltonian method, where the magnetic moment in each site of the lattice is coupled to strains, and the minimum of energy obtained through the Monte Carlo method. In the simplest version, the magnetic system is 2D Ising (anti)ferromagnetic lattice, with nearest neighbors interactions only, and the electric moments are non-coupled, permanent moments. Within this approximation, the second order magnetic transition induces ferroelectricity in the electric dipoles. We show that these calculations can be extended to other magnetic systems, (x-y model and 3D Heisenberg) with coupling to the electric moments will, so they can be applied to model realistic systems such as the olivines mentioned above.

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