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Bond polarization induced by magnetic order JUNG HOON HAN, SungKyunKwan University, CHENGLONG JIA, KIAS, SHIGEKI ONODA, NAOTO NAGAOSA, University of Tokyo — A number of recent experimental breakthroughs have revived interests in the phenomena of coupling of magnetic and electric (dipolar) degrees of freedom in a class of materials known as "multiferroics". Some noteworthy observations include the development of dipole moments accompanying the collinear-to- helical spin ordering and adiabatic control of dipole moments through sweeping of applied magnetic fields, which all unambiguously point to the strong coupling of electric and magnetic degrees of freedom in these compounds. A number of phenomenological and microscopic theories has been advanced to establish the connection between noncollinear spin order and ferroelectricity. In particular the work of Katsura, Nagaosa, and Balatsky proposed a microscopic theory for the interplay between non- collinear magnetic order and the dipolar polarization of the electronic wave function induced by it. The magnetic (M) ion is modeled by three degenerate t_{2g} levels experiencing some external magnetic field (to guarantee magnetic order) and subject to spin-orbit coupling. Two such magnetic ions are bridged by an intermediate oxygen (O) atom which itself has no spin-orbit interaction. Solving the model Hamiltonian perturbatively in the M-O hybridization amplitude, KNB finds an electronic polarization orthogonal to the M-O-M axis in the ground states of one and two holes.

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