

Relationship between ferroelectricity and Dzyaloshinskii-Moriya interaction in
multiferroics and the effect of bond-bending

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Abstract

We studied the microscopic mechanism of multiferroics, in particular with the "spin current" model (H. Katsura, N. Nagaosa and A. V. Balatsky, Phys. Rev. Lett. **95**, 057205 (2005)). Starting from a system with helical spin configuration, we solved for the forms of the electron wave functions and analyzed their characteristics. The relation between ferroelectricity and Dzyaloshinskii-Moriya interaction (I. Dzyaloshinskii, J. Phys. Chem. Solids **4**, 241 (1958) and T. Moriya, Phys. Rev. **120**, 91 (1960)) is clearly established. There is also a simple relation between the electric polarization and the wave vector of magnetic orders. Finally, we show that the bond-bending existing in transition metal oxides can enhance ferroelectricity.

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