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Multiferroicity due to Charge Ordering

JEROEN VAN DEN BRINK, IFW Dresden

In this contribution I discuss multiferroicity that is driven by different forms of charge ordering, presenting first the generic mechanisms by which charge ordering can induce ferroelectricity in magnetic systems. In type-I multiferroics [1], ferroelectricity and magnetism have different origins and occur at different temperatures. There is a number of specific classes of materials for which this is relevant. Discussed will be in some detail (i) perovskite manganites of the type (PrCa)MnO3 [2,3], (ii) the complex and interesting situation in magnetite Fe3O4, (iii) strongly ferroelectric frustrated LuFe2O4 and (iv) an example of a quasi-one-dimensional organic system [4]. In type-II multiferroics [1], ferroelectricity is completely due to magnetism, but with charge ordering playing an important role [5], such as (v) multiferroic Ca3CoMnO6, (vi) possible ferroelectricity in rare earth perovskite nickelates of the type RNiO3 [6,7], (vii) multiferroic properties of manganites of the type RMn2O5 [8], (viii) perovskite manganites with magnetic E-type ordering.

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