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General Theory for the Ferroelectric Polarization Induced by Spin-Spiral Order HONGJUN XIANG, Fudan University, ERJUN KAN, Nanjing University of Science and Technology, YUEMEI ZHANG, M.-H. WHANGBO, North Carolina State University, XINGAO GONG, Fudan University — Multiferroics display magnetic, polar and elastic order parameters simultaneously and hence present fascinating fundamental physics and potentially promising applications. The multiferroic phenomenon has been explained by several different models. However, none of them can correctly describe the ferroelectric polarization of triangular-lattice antiferromagnets induced by helical spin-spiral order. To resolve this problem, we develop a general theory for the ferroelectric polarization induced by spin-spiral order on the basis of symmetry considerations and then evaluate the coefficients needed to specify the general theory on the basis of density functional calculations. Our theory not only explains the ferroelectricity of triangular-lattice antiferromagnets driven by helical spin-spiral order, but also incorporates all known models of magnetic-order-driven ferroelectricity as special cases.

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