Magnetic modes compatible with the symmetry of crystals

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We present a classification of magnetic point groups which give an answer to the question: Which magnetic groups can describe a given magnetic mode? There are 32 categories of magnetic point groups which describe 64 unique different magnetic modes: 16 with a ferromagnetic component and 48 without. This classification focused on magnetic modes is helpful for finding the magnetic space group which can describe the magnetic symmetry of the material.

The classification selects the magnetic space groups and the magnetic site-symmetry point groups which are compatible with a number of magnetic phenomena e.g. collinear antiferromagnetism and ferromagnetism, spin roerientation, antiferromagnetism with weak ferromagnetism. The use of our classification is demonstrated on a number of well-studied materials, e.g. alpha-Fe2O3, rare earth orthoferrites, RFeO3. It is particularly useful for materials with weak ferromagnetism. Examples of use for neutron powder diffraction studies are discussed in the context of the paper by Shirane (1958).

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