Magnetic properties of iron doped magneto-electric LiNiPO₄ single crystals

JIYING LI, JEREL L. ZARESTKY, DAVID VAKNIN, Ames Laboratory and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA. — Neutron scattering and magnetic susceptibility studies of pure and iron-doped magneto-electric LiNiPO₄ single crystals are compared. Elastic neutron scattering of single-crystal LiNiPO₄ reveal a spontaneous first-order commensurate-incommensurate magnetic phase transition (at $T_{IC} = 20.8$ K) accompanied by a second transition ($T_{IC} = 21.7$ K) from long- to short-range IC structure. These transitions are also identified in the magnetic susceptibility measurements. The modulated structure has a predominant antiferromagnetic component giving rise to satellite peaks in the vicinity of the fundamental antiferromagnetic peak, and a ferromagnetic component giving rise to peaks at small momentum transfers around the origin (0, ±Q, 0). The wavelength of the modulated magnetic structure varies continuously with temperature. Magnetic susceptibilities of the iron doped crystals show magnetic-field dependent properties characteristic of spin-glass systems.

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