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Magnetic anisotropy in Iron-phosphate crystal $RbNa_3Fe_7(PO4)_6$[1]

CHENGTAO YU, MICHAEL PECHAN, Department of Physics, Miami University, WENDY QUEEN, SHIOU-JYH HWU, LEI WANG, Department of Chemistry, Clemens University — Low dimensional iron-phosphate single crystal $RbNa_3Fe_7(PO4)_6$ has been synthesized using high temperature methods in molten-salt media. The crystal consists of FeO_n polyhedra chains (direction a), bridged via the long oxygen band of the polyhedra and the PO_4 tetrahedra to form a three dimensional framework. Magnetic properties of the compound have been investigated down to 2 K. Both susceptibility and magnetization as function of temperatures indicate the compound is paramagnetic at high temperatures and has a ferromagnetic phase transition around 15K. Magnetization loops at low temperatures show large coercivities and saturation fields. For example, the coercive fields at 2 K are about 1.5 and 1.6 Tesla along and perpendicular to the chain direction, respectively. The magnetic loops also reveal that the chain direction is the magnetic easy axis, though the sample cannot be completely saturated even at a maximum field of 9 Tesla. Magnetic torque measurements show that the sample possesses uniaxial anisotropy with magnetic easy axis in the chain plane and hard axis perpendicular to the chain plane.

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