Hydrothermal growth of synthetic Rouaite ($Cu_2(NO_3)(OH)_3$): A frustrated S=1/2 triangular-lattice magnet

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The hydrothermal technique is an efficient strategy to synthesize mineralogically inspired structures, including natural and synthetic cuprate minerals with a variety of exciting frustrated magnetic lattices. We report the hydrothermal growth of synthetic rouaite, $Cu_2(NO_3)(OH)_3$. Deep blue single crystals up to 12×5×5 mm^3 in size were grown, and their alignment may be determined by eye. Neutron diffraction studies were performed to determine the compound's crystal and magnetic structure. $Cu_2(NO_3)(OH)_3$ crystallizes in a monoclinic structure consisting of alternating ferromagnetic and antiferromagnetic chains of Cu^{2+}. This is similar to botallackite $Cu(OH)_3Br$, in which spinon-magnon mixing was recently reported. We report details of the crystal growth, crystal structure, magnetic structure, and the low-temperature magnetic and thermal properties.