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Synthesis and characterization of tutton salt: $\text{KNH}_4\text{Co}(\text{SO}_4)_2(\text{H}_2\text{O})_6$

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The Tutton salts belong to an isomorphic crystallographic family that has attracted considerable attention in the scientific community due to their potential for understanding physicochemical properties, growth mechanisms, phase transitions, and transformations, as well as their technological and health-related potential. However, there remains a scarcity regarding their structural aspects. Motivated by this, the Tutton salt $\text{KNH}_4\text{Co}(\text{SO}_4)_2(\text{H}_2\text{O})_6$ was synthesized and characterized to contribute to studies focusing on its physical properties. The salt was synthesized through slow solvent evaporation and characterized using powder X-ray diffraction (PXRD), thermogravimetry (TG), differential thermal analysis (DTA), and Fourier-transform infrared spectroscopy (FTIR). Analysis of the refined PXRD pattern using the Rietveld method revealed that the sample crystallized in the monoclinic system with space group $P2_1/a$, containing two formula units per unit cell. Thermal analysis indicated that the crystals are stable up to around 80°C , above which they undergo dehydration, releasing the 6 coordinated water molecules. The FTIR spectrum showed vibrational modes associated with the vibrations of the H_2O , SO_4 , NH_4 , and $[\text{Co}(\text{H}_2\text{O})_6]$ groups. Finally, the results suggest that the $\text{KNH}_4\text{Co}(\text{SO}_4)_2(\text{H}_2\text{O})_6$ crystal is a promising candidate for use in the development of thermochemical energy storage devices due to its low dehydration temperature, high enthalpy, and good energy density.