Synthesis Methods for $Ce(CrO_4)_2 \cdot xH_2O$ and Crystal Structures of K_2CrSO_7, $(NH_4)_2Cr_2O_7$ and $Na_2Cr_2O_7 \cdot 2H_2O$

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Z. Naturforsch. **2007**, *62b,* 771 – 777; received January 1, 2007

New and quick methods to synthesize $Ce(CrO_4)_2 \cdot 2H_2O$ and $Ce(CrO_4)_2 \cdot H_2O$, giving high yields, are described. The methods are based on exchange reactions by refluxing in water or on solid state reactions. The first crystal structure containing a chromatosulfato ion is presented. K_2CrSO_7 belongs to space group $P2_1/n$ with $a = 7.4024(1)$, $b = 7.3908(1)$, $c = 12.9883(2)$ Å, $\beta = 90.021(1)^\circ$ and $Z = 4$. The $CrSO_7^{2-}$ ion, consisting of one chromate group sharing one oxygen atom with one sulfate group, has a *pseudo syn-*C_{2v} conformation with eclipsed oxygen atoms. K_2CrSO_7 forms a three dimensional network of $CrSO_7^{2-}$ ions held together by the charge balancing potassium ions, with the general structural features common with dichromate-like structures. The redetermination of the structures of $(NH_4)_2Cr_2O_7$ (space group $C2/c$, with hydrogen atoms located) and $Na_2Cr_2O_7 \cdot 2H_2O$ (space group $P2_1$, with hydrogen atoms located and the absolute structure established) are reported.

Key words: Hydrated Cerium Chromates, Chromatosulfate, Dichromates, Oxidizing Agents, Single Crystal X-Ray Diffraction