

Growth of $\text{Cs}_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ and $\text{Rb}_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ and their Characteristics

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At the present time ammonium nickel sulfate hexahydrate (ANSH) and potassium nickel sulfate hexahydrate (KNSH) crystals are successfully used as ultraviolet light filters. However their starting dehydration temperatures are relatively low: 96°C and 97°C for ANSH and KNSH. The purpose of our work is to grow $\text{Cs}_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ (CNSH) and $\text{Rb}_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ (RNSH) crystals for further investigations of their atomic structure, optical transmission spectra and thermal stability. These crystals belong to the Tutton's salts as well as crystals mentioned above.

CNSH and RNSH crystals belong to the monoclinic space group $P2_1/C$. Transparent green CNSH and RNSH single crystals with dimensions of 50×50×25 mm of good optical quality have been grown from water solutions. First the crystal structure of CNSH was determined by X-ray diffraction method; the lattice parameters are: $a=6.3576(8) \text{ \AA}$, $b=12.7660(17) \text{ \AA}$, $c=9.2550(10) \text{ \AA}$, $\beta=106.97(01)^\circ$, $V=718.4 \text{ \AA}^3$, $Z=2$, $D_c=2.887 \text{ g}\cdot\text{cm}^{-3}$.

We carried out the comparative analysis of the optical transmission spectra of the CNSH and RNSH crystals. On the whole, their optical characteristics are similar to those of α -NSH, ANSH and KNSH. They have similar transmission bands in visible and UV – ranges of spectrum. Thermo-gravimetric analysis showed that the starting dehydration temperatures of the CNSH and RNSH crystals are 111°C and 126°C respectively. Real structure of CNSH and RNSH crystals was studied by projection X-ray topography.

Keywords: crystal growth, optical properties, structural analysis