SYNTHESIS AND STUDY OF NOVEL Ln(III)-CONTAINING ISOSTRUCTURAL HETEROPOLY TUNGSTATES $Na_9[Ln(W_5O_{18})_2]\cdot 34.25H_2O$ (Ln = La, Pr)

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The conditions necessary for the synthesis of crystalline isostructural sodium heteropoly decatungstolanthanidates(III) $Na_9[Ln(W_5O_{18})_2]\cdot 34.25H_2O$ (Ln = La (1), and Pr (2)) with needle-like micromorphology were elaborated. X-ray single crystal analysis for 1 and 2 was performed (figure 1), revealing fundamental data for the crystal structures of novel heteropoly tungstates with Peacock–Weakley type of anion. The study demonstrated that the polyhedron of the Ln(III) heteroatom is a square antiprism formed by two tetradentate lacunary isopoly pentatungstate anions $[W_5O_{18}]^{6-}$.

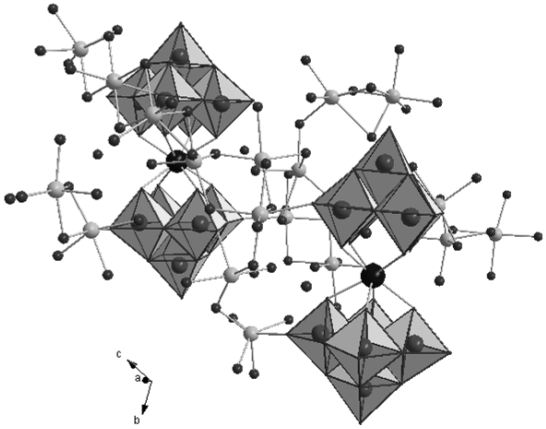

Fig. 1. Crystal structure of $Na_9[Ln(W_5O_{18})_2]\cdot 34.25H_2O$ (Ln = La, Pr)

The set of oscillations characteristic for the heteropoly tungstate anions with Peacock–Weakley type of structure was established by the methods of FT-IR and FT-Raman spectroscopy, providing valuable insights into their structure and properties.

The anions $[Ln(W_5O_{18})_2]^{9-}$ in a 3D structure are in a network of polyhedra constructed from distorted tetragonal pyramids NaO_5 and distorted octahedra NaO_6. In the cavities of the structure, uncoordinated H_2O molecules are present, which are held in positions by H-bonds. It is established that changes in the cationic sub-lattice composition and the presence of different number of H_2O molecules in the structure do not affect bond lengths and valence angles in the heteropoly anion $[Ln(W_5O_{18})_2]^{9-}$. The grain size of powder was established by SEM (300–400 nm for 1, and 400–500 nm for 2). The single-phaseness of salts was confirmed by consistent surface characteristics in the BEI mode, and by the uniform distribution of La (Pr), Na, W, and O while scanning the surface with characteristic X-ray radiation.

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