

FORMATION OF SODIUM HETEROPOLY DECATUNGSTOEUROPATE(III)

 $\text{Na}_9[\text{Eu}(\text{W}_5\text{O}_{18})_2] \cdot 35\text{H}_2\text{O}$ IN AQUEOUS SOLUTION*Mariichak O. Yu.*, Rozantsev G. M., Radio S. V.

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Lanthanide containing materials are receiving increasing attention due to their wide range of potential applications. To investigate the reaction of formation of Eu(III)-containing heteropoly anion individual aqueous solutions of $\text{Eu}(\text{NO}_3)_3$ ($C = 0.01 \text{ mol/L}$) and $\text{Na}_9[\text{Eu}(\text{W}_5\text{O}_{18})_2] \cdot 35\text{H}_2\text{O}$ (with $C(\text{Eu}^{3+}) = 0.01 \text{ mol/L}$) were prepared. The synthesis of sodium heteropoly decatungstoeuropate(III) $\text{Na}_9[\text{Eu}(\text{W}_5\text{O}_{18})_2] \cdot 35\text{H}_2\text{O}$ from acidified up to $Z = \nu(\text{H}^+)/\nu(\text{WO}_4^{2-}) = 0.80$ aqueous solution of sodium tungstate with a ratio of $\nu(\text{Eu}):\nu(\text{W}) = 1:10$ was done. Using FT-IR and Raman spectroscopy it was shown that heteropoly anion contained in the isolated salt belong to Peacock–Weakly structure. The structure of $\text{Na}_9[\text{Eu}(\text{W}_5\text{O}_{18})_2] \cdot 35\text{H}_2\text{O}$ was determinsd by Single Crystal X-ray analysis.

The spontaneous formation of $\text{Na}_9[\text{Eu}(\text{W}_5\text{O}_{18})_2] \cdot 35\text{H}_2\text{O}$ through a simple ionic self-assembly method and the influence of different values of the temperature were investigated by using UV-Vis spectroscopy (Fig.).

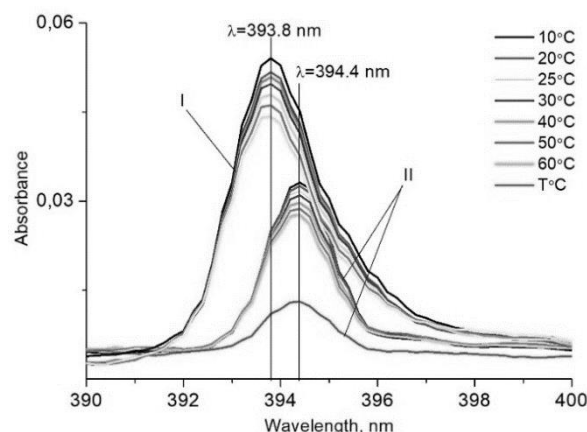


Fig. Electronic absorption spectra of the solutions:

I – $\text{Eu}(\text{NO}_3)_3$ ($C = 0.01 \text{ mol/L}$); II – $\text{Na}_9[\text{Eu}(\text{W}_5\text{O}_{18})_2] \cdot 35\text{H}_2\text{O}$ ($C(\text{Eu}^{3+}) = 0.01 \text{ mol/L}$),
 $T^\circ\text{C}$ – measurement was done at 25°C after 24 hours of $\text{Na}_9[\text{Eu}(\text{W}_5\text{O}_{18})_2] \cdot 35\text{H}_2\text{O}$ boiling

The presence of hypochromic shift in the heteropoly salt solution was established that is caused by the change in coordination polyhedron of Eu(III) ion during transition from aqua complex to Peacock-Weakley heteropolyanion with coordination towards the heteroatom of lacunar pentatungstate anions, $\text{W}_5\text{O}_{18}^{6-}$, in the form of square antiprisms. There are two maxima peaks at 393.8 nm and 394.4 nm, which belong to europium nitrate and sodium heteropoly decatungstoeuropate(III), respectively. There is the directly proportional dependence between absorbance values and temperature. It shows that the absorbance decreases with the temperature from 10 to 60°C in case of $\text{Eu}(\text{NO}_3)_3$, and $\text{Na}_9[\text{Eu}(\text{W}_5\text{O}_{18})_2] \cdot 35\text{H}_2\text{O}$. The absorbance of decatungstoeuropate(III) at 25°C after 24 hours of sample's boiling is noticeably lower. This suggests that the concentration of the compounds in the samples became lower. Also, a large ligand peak was observed in europium nitrate around the 290–310 nm, and in the case of sodium decatungstoeuropate(III) solution there is a big plato in the range of 200–320 nm.

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