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SYNTHESIS AND PROPERTIES OF MONOMETALLIC NICKEL(II) AND ZINK AQUA AMMINE MONODIPHOSPHATES

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New functional materials based on inorganic phosphates are widely used in modern technology and agriculture.

The aim of this study was to prepare solid monometallic mixed salts with a controlled ratio of anionic contents between PO_4^{3-}:$P_2O_7^{4-}$ have not been described in literature. Phosphates were prepared by salting out from aqueous ammoniac solution.

The nickel content of the samples was determined gravimetrically with dimethilglyoxime; the zink content, titrimetrically with EDTA; the phosphorus content, gravimetrically by the quinolone-molybdenium method; the ammonia content, by distillation in a vacuum on Seren'ev's apparatus; and total water and ammonia content, from the weight loss on heating 1023°K in the course of 2 h.

The IR spectra were taken on a Specord 75-IR spectrophotometer. Samples of compounds to be analyzed were prepared in the form of KBr pellets in which the concentration of a substance under study was 0.2-0.3 wt %.

Anions components in phosphates were estimated by using data of qualitative and quantitative paper chromatography.

The X-ray phase analysis was carried out on a DRON-UM1 diffractometer (CuK_α radiation). A single crystal of graphite placed in a diffracted beam was used as monochromator. The diffraction patterns were taken by the method of step scanning in the range of angles $2\Theta = 4\ldots80°$. The scanning step was 0,05°, and the expose time in a was 3…9 s. The measured diffraction maxima were approximated by the pseudo-Voigt function, with the $K\alpha_1$ component being separated out.

Solid $Ni_{2,5}(PO_4)_{1,0}\cdot(P_2O_7)_{0,5}\cdot 3{,}4NH_3\cdot 6{,}0H_2O$ and $Zn_{2,5}(PO_4)_{1,0}(P_2O_7)_{0,5}\cdot 2{,}5NH_3\cdot 2{,}1H_2O$ with controlled ratio of anionic contents, were prepared by salting out from aqueous ammoniac solutions.

For synthesis of Nickel(II) aqua ammine monodiphosphate as starting reagents we used mechanical mixture consisting of $Ni_3(PO_4)_2\cdot 8H_2O$ and $Ni_2P_2O_7\cdot 6H_2O$ with a specified molar ratio of the PO_4^{3-} i $P_2O_7^{4-}$; water ammonia (23÷25% mas) and acetone. Zink aqua ammine monodiphosphate was synthesized by the same method. As starting reagents we used mechanical mixture consisting of $Zn_3(PO_4)_2\cdot 4H_2O$ and $Zn_2P_2O_7$ with a specified molar ratio of the PO_4^{3-} i $P_2O_7^{4-}$

It should be noted, that Nickel(II) aqua ammine monodiphosphate included more, than Zink aqua ammine monodiphosphate. It may indicate a different saturation degree of metal ion in coordination sphere. For Ni^{2+} normally coordination number is 6, and for Zn^{2+} - 4.

Nickel(II) and zinc aqua ammine monodiphosphates with a fixed ratio of anionic contents can be only synthesized, when as starting reagents were used mechanical mixtures consisting of $Ni_3(PO_4)_2 \cdot 8H_2O$ and $Ni_2P_2O_7 \cdot 6H_2O$, and $Zn_3(PO_4)_2 \cdot 4H_2O$ and $Zn_2P_2O_7 \cdot 5H_2O$ with a molar ratio of $PO_4^{3-}:P_2O_7^{4-}=2:1$.