

POTASSIUM FERRATE(VI) – A NEW REAGENT FOR SPECIAL WATER TREATMENT

Golovko D.A.¹, Goncharova I.V.²

¹*Ukrainian State University of Chemical Technology, Ukraine, Dnipro, olimp17tnv@ukr.net*

²*Kyiv National University of Trade and Economics, Ukraine, Kyiv, irina.goncharova.knteu@gmail.com*

Nowadays, high demands on the quality of water determine the development of new methods for its purification. The ferrates of alkaline metals (salts of ferric acid H₂FeO₄) are of particular interest. Due to their strong oxidizing properties these compounds are an alternative to traditional reagents used for the water treatment [1].

The ferrates(VI) of alkaline metals are promising reagents for the water purification from organic and inorganic impurities, as well as the disposal of radioactive waste [2, 3]. However, purification from radionuclides is substantially difficult if they are bound into strong complex compounds. The expediency using of Fe(VI) compounds is due to the ability of ferrates to destroy metal complexes. Therefore, the aim of this study was to develop the ferrate technology for water treatment of liquid radioactive waste using model solutions, which are cobalt oxalate complexes, ⁶⁰Co(II).

At the first stage of purification, it was proposed to precipitate excess anions of oxalate using Ca(II) compounds:



for reducing the reagent consumption, which goes into interaction with unbound C₂O₄²⁻ ions. This is fast and complete process, since the solubility equilibrium of calcium oxalate is 1.7·10⁻⁹. Ferrate treatment is carried out at the next stage after filtration. It was proved that as a result of reaction with ferrate, anions of oxalate are oxidized to carbonate ions. At the same time Co(II) compounds pass into slightly soluble forms of Co(III) oxyhydroxide.

Therefore, the total reaction can be represented by the following equation:



The processes of the Co(II) → Co(III) transition and the destruction of ligands, which proceed quite quickly (within a few minutes), were shown. Thus, these chemical reactions are not limiting stages of the whole water treatment process.

It was established that using of ferrate treatment allows not only to destroy the strong oxalate complexes of Co(II) (oxidation to Co(III) proceeds with a 100% yield), but also to separate cobalt from the system in the form of CoO(OH) with high efficiency (96–100%) by coprecipitation with the resulting of iron(III) oxyhydroxide.

References

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