Amperometric determination of yttrium with β-hydroxyethylimide solution

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Yttrium and its compounds are used to create high-temperature ceramics, quantum mechanical amplifiers, lasers, phosphors, emission materials, dielectrics, high-power halogen lighting lamps, catalysts, etc. Its valuable properties are high temperature stability, enhanced strength, corrosion and radiation resistance. The basis of the work is the development of new and improvement of existing analytical methods for determining the content with high sensitivity, accuracy and a wide range of detectable concentrations. Optimized conditions for amperometric titration (AT) of the method for determining the mass concentrations of yttrium with β-hydroxyethylimide reagent in various natural objects with improved metrological indicators (correctness, reproducibility, expansion the determination range for contaminant content, selectivity, etc.). Based on the detected volt-ampere characteristics of β-hydroxyethylimide on platinum disks of microanode in the presence of various background electrolytes in a dimethylformamide solutions, it follows that amperometric indication of the end point of titration (EPT) of yttrium ions with two indicator electrodes should be performed at a voltage of 0.20- 1.20 V. When titrated with β-hydroxyethylimide solutions, depending on the nature of the background used, arisen anodic current of the AT titrant should conduct in the potential range of 0.65 -0.8 V. The effect of different in nature background electrolytes and buffer mixtures with pH 1-12 on the results of titration was investigated. It was found that yttrium is sufficiently titrated in weakly acidic medium (pH 4.28-6.36), and in neutral and basic medium – they form less-stable complex compounds with this reagent and, in turn, are not titrated well enough. For a statistical evaluation of the accuracy of the determined method of determining the amount of yttrium with β-hydroxyethylimide solution, many different multiple (at least 4 times) repetitions of each determination were carried out under the following optimal conditions: 2.0 ml of 0.04 M universal buffer solution (pH 1.81)), the difference potentials $\Delta E = 0.8$ V, the total volume of the test solution is 10 ml. Experiments have shown that AT ions of yttrium complexes are obtained in the composition of Me:Reagent = 1:1. The proportional relationship between the amount of metal taken and the amount of reagent consumed is fairly well observed. The molar ratios of the metal and the reagent are calculated through logarithmic method, (Me:HR=1:1), as well as the stability constant of the complex compound, K = 3.6 * 104, which indicates the stability of the complex and the selectivity of the method. The lower limit of the designated contents (CH) is 0.8 μg/ml. Metrological characteristics of AT yttrium with a solution of the imid- containing reagent under o investigation on different in nature background electrolytes under optimized conditions indicates the high accuracy of the proposed technique. The developed method for the determination of yttrium can be applied to the analysis of alloys, minerals and ores