ADSORPTION OF TRIBUTYL PHOSPHATE ON MINERAL ADSORBENTS

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The practice of extraction removal and separation of colored metal ions is often faced with the problem of extractant losses, the large losses of tributyl phosphate (TBP) during the extraction isolation of uranium from ore residues is being one such example. A possible reason for this phenomenon could be adsorption of TBP on various components of ore residues present as impurities, e.g. kaolin, micas, silicon dioxide, ferric oxides, etc.

A solution to this problem is vital since because such losses often complicate the operation of a given extraction process. Also extractant recovery is being very expensive and its presence in wet sludge sites leading to environmental pollution [the maximum allowable concentrations (MAC) of the most widespread extractants lie within the range 0.01–0.05 mg/l with MAC_{TBP} = 0.01 mg/l].

We present below the results of experiments undertaken with a view to establishing the basic conditions necessary for the adsorption of TBP on kaolin and muscovite mica. The influence of pH and temperature on the adsorption process has been established and an attempt made to explain the mechanism of the adsorption process whose basic thermodynamic parameters have been calculated.

The aqueous solutions of TBP, containing 300mg TBP in liter were used as the objects of the research. Kaolin (a product of decomposition aluminum silicates $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$) and muscovite mica composition $KAl_2[AlSi_3O_{10}](OH,F)_2$ were used as adsorbents.

It has been established that the adsorption of TBP on kaolin and muscovite mica has a polymolecular character, and the Giles classification adsorption isotherms [1] refer to S- and L-type. As the temperature of the TBP solutions increases from 20 to 50 °C, the nature of the adsorption isotherm does not change, and the adsorption decreases itself. This allow us to conclude that the adsorption of TBP on solid sorbents is mainly of a physical nature.

With an increase in the concentration of sulfuric acid from 1 to 3 mol/l, adsorption gradually increases, and at a concentration of 6 mol/l, the isotherms are characterized by a sharp rise in the region of small equilibrium concentrations of the adsorbate.

The possibility of desorption of TBP with water and solutions of sulfuric acid is shown. The greatest completeness and rate of desorption is observed in water. When sulfuric acid is added to water, the rate and completeness of desorption decreases. Especially bad TBP is desorbed (passes into solution) in 6 M sulfuric acid solutions. Desorption is the most effective when it flows in the same environment in which adsorption has taken place. With increasing temperature from 20 to 50 °C, the rate and completeness of desorption decreases.

It is established that the TBP, which has passed as a result of desorption from the surface of solid sorbents to the solution, can be isolated from it by flotation, it is attached to the main extract and subjected to further processing with it.

[1] G. Parfitt, and K. Rochester, *Adsorption from Solution at the Solid–Liquid Interface*, 1986, Word, Moscow.