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Study of the extraction of Zn(II) compounds from aqueous two-phase systems by liquid extraction

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Abstract

In this work, we investigated the dependences of the parameters during the extraction of Zn(II) from aqueous two-phase systems (ATS) formed from polyethylene glycol-1500 (PEG-1500) – Na₂SO₄. The concentrations of the phase-forming components were selected in accordance with the phase diagram of the system. Aqueous two-phase systems based on polymer macromolecules consist of two mutually immiscible phases: a polymer-rich (water-polymer) upper phase and a salt-rich (water-salt) lower phase, which were used for extraction experiments. To determine the pH of the initial Na₂SO₄ salt solution, a SevenExcellence pH ionometer equipped with a combined glass electrode was used. Without adding a suitable extractant to a system consisting of a mixture of equal volumes of PEG-1500 and Na₂SO₄, Zn(II) remained predominantly in the lower water-salt phase. The change in the degree of acidity of the medium (pH) of the solution of the water-salt phase did not strongly affect the efficiency of extraction into the upper phase. With the addition of chloride ions, an increase in the efficiency of Zn(II) extraction was observed. The degree of extraction (E,%) in the extraction of Zn(II) in the presence of chloride ions Cl⁻ depends on the degree of pH of the aqueous salt phase and the concentration of chloride ions added to the extraction system. It has been shown that the efficiency of Zn(II) extraction in the presence of chloride ions increases with an increase in the acidity of the lower water-salt phase, which is due to an increase in the hydrophobicity of the upper water-polymer phase with polyethylene glycol. It is important that for the effective extraction of metal ions in aqueous two-phase systems, two conditions must be met, this is the formation of a stable

extractable complex or compound of a metal ion and an extractant, as well as these extractable complexes or compounds must have a low degree of hydration.

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