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DETERMINATION OF COPPER (II) AND LEAD (II) IONS BY SODIUM SALT OF 4-PHENYLSEMICARBAZONE 1,2-NAPHTHOQUINONE-4-SULFONIC ACID

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For spectrophotometric determination of copper (II) and lead (II) ions a new reagent, sodium salt of 4-phenylsemicarbazone 1,2-naphthoquinone-4-sulfonic acid has been proposed, which allows to measure the micro-amounts of copper in the tap water, copper alloys and lead ions in alloys in the presence of interfering ions (bismuth (III), mercury (II)).

This method is relatively simple in the synthesis of reagent, which is easily re-crystallized from water-ethanol solution and is stable in the crystalline state. It is also characterized by low cost and high sensitivity. Copper (II) and lead (II) ions in acetate buffer, pH 5.74 - 6.51 (for copper ions) and pH of 6.1 - 7.0 (for lead ion) form colored complexes of red-pink color with absorption maxima at 520 nm and 550 nm, respectively, while the individual reagent under these conditions absorbs at 440 nm.

The following optimal conditions of complexation have been established: the acidity of the medium, the concentration of copper (II) and lead (II) ions, compliance to the key law of light absorption (Beer–Lambert–Bouguer), the complex composition (1:1 for copper and 1:2 for lead).

The calculated value of the complex stability constant for copper ions (II) is $\log\beta = 4.53$, the molar absorption coefficient is $3 \cdot 10^4$ $L \cdot mol^{-1} \cdot cm^{-1}$, the Beer–Lambert–Bouguer law obeys within the concentration range of $0.3 \cdot 10^{-6}$ up $4.0 \cdot 10^{-5}$ mol/L. For lead (II) ions the complex stability constant is $\log\beta = 9.18$, the measured molar absorption coefficient is $1.5 \cdot 10^4$ $L \cdot mol^{-1} \cdot cm^{-1}$, the Beer–Lambert–Bouguer law is accomplished between the concentration range $2.0 \cdot 10^{-6}$ and $1.0 \cdot 10^{-5}$ mol/L.

The methods of determining copper (II) ions in tap water, superconducting ceramics and copper alloys, as well as lead (II) ions in alloys, have been developed. For their determination the following ions do not interfere: iron (II), iron (III), manganese (II), magnesium, calcium, sodium, potassium (at concentrations not exceeding $1.0 \cdot 10^{-2}$ mol/L). The interfering effect exerts bismuth (III) and mercury (II) ions at concentrations of $1.0 \cdot 10^{-5}$ mol/L and higher).