Indian Journal of Chemistry
Vol. 63, May 2024, pp. 500-505
DOI: 10.56042/ijc.v63i5.9289

Spectrophotometric determination of copper(II) ion with 7-bromo-2-nitroso-1-oxinaphthalene-3,6-disulphocid

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Received 4 March 2024; accepted(revised) 23 April 2024

An organic analytical reagent reacts violently with Cu(II) ion, forming a blue water-soluble complex. A method of spectrophotometric detection of the complex formed by Cu(II) ion with 7-bromo-2-nitroso-1-oxynaphthalene-3,6-disulfoacid (BNOKS-S, S-3,6) (HR) reagent was developed. Optimal conditions were studied: λ_{max}= 600, *p*H = 4.0, universal buffer, reagent buffer - Cu(II) - distilled water, BNOKS-S, S-3 with 0.05% relative to T_{Cu}^{2+}=10 μg/25mL. It was found that 1.4 mL volume of 6 reagents is sufficient. It was determined that the area of obedience to the Bouguer-Lambert-Behr law is 0.5-15 μg/25mL. Absorption spectra were studied: sensitivity according to Sendel was 0.00092 μg/cm2, contrast $\Delta\lambda$ = 110 nm. The composition of the complex and the mechanism of complex formation were studied using the Nazarenko method, the isomolar series method, Asmus' straight line method, and spectrophotometric titration methods. The molar ratio of the complex is Me:R = 1:2. Actual molar extinction coefficient (ε_{real} = 58824), formation equilibrium constant (K_{equilb}= 15.23), stability constant of the complex using the Babko method (lgβ= 19.52), the confidence interval of the deviation from the mean value (ΔX = 0.117) and the lower limit of detection (Q_{min} = 0.141 μg/25mL) were determined. The results of the graduated graph were mathematically processed using the method of small squares and a linear mathematical equation was developed: $Y_i = 1{,}1 \cdot 10^{-3} + 2{,}4 \cdot 10^{-2} X_i$. The effect of foreign ions was studied. The developed method was used in an artificial mixture.

Keywords: Cu(II) ion, Bouguer-Lambert-Behr law, 7-Bromo-2-nitroso-1-oxynaphthalene-3,6-Disulfoacid