

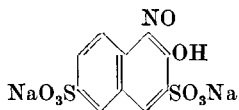
## Spectrophotometric Determination of Copper(II) using Nitroso R Salt as a Chromophoric Reagent

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### Summary

Nitroso R Salt permits a simple colorimetric determination of copper with a sensitivity of 0.063/cm<sup>2</sup> (SANDELL). The system adheres to BEER's law over a range 0.21 to 8,7 p. p. m. Conditions and interferences are described in detail.

Nitroso R Salt as designated by the following structure:



has extensively been used for the colorimetric determination of cobalt. The composition and stability of metal chelates of copper<sup>1)</sup>, palladium<sup>2)</sup>, and thorium<sup>3)</sup> with nitroso R Salt have been studied in these laboratories. This communication reports the analytical application of the 1:1 copper-Nitroso R Salt chelate ( $\lambda_{\max}$  480 m $\mu$ , pH 3.0).

### Experimental

**Materials:** Stock solutions of Nitroso R Salt (B. D. H.) and copper sulphate (B. D. H. AnalaR) were prepared in double distilled water. Solution of different concentrations were prepared by suitable dilutions.

**Instruments:** A Unicam SP 500 spectrophotometer operated by a DORAN's mains unit was used for absorptiometric measurements. Matched glass cells of 10 mm thickness were used in each case.

A, L and N direct reading pH indicator was employed for the adjustment of hydrogen ion concentrations.

**Procedure adopted.** For the determination of copper by this method the interfering substances were removed. Pure solutions of copper was directly treated with an excess of Nitroso R Salt between pH 2.5 and 6.5. The colour intensity was measured with a Unicam SP 500 spectrophotometer.

<sup>1)</sup> R. L. SETH, Doctoral thesis, 1961, Allahabad University.

<sup>2)</sup> S. P. SANGAL and A. K. DEY, Ind. Chem. Soc. (communicated).

<sup>3)</sup> S. P. SANGAL, J. prakt. Chem. **23**, 108 (1964).

### Results and Discussion

**Effect of time on the colour intensity of the chelate:** A mixture containing Nitroso R Salt and copper sulphate (pH 3.0) immediately attained its maximum intensity of colour but the solutions were kept for thirty minutes for attaining equilibrium.

**Effect of temperature:** The absorbance reading of a mixture containing  $1.0 \cdot 10^{-3}$  M Nitroso R Salt and  $3.33 \cdot 10^{-4}$  M copper sulphate remained constant at (480 m $\mu$ ) at all temperatures from 5 to 95°.

**Effect of pH on the intensity of the colour:** The absorbance of different mixtures containing Nitroso R Salt ( $4.0 \cdot 10^{-4}$  M) and copper sulphate ( $6.67 \cdot 10^{-5}$  M) was measured at different pH (at 480 m $\mu$ ) and it was found that the colour intensity remained constant between pH 2.5 and 6.5.

**Adherence to BEER's Law:** The conformity to BEER's law was tested by treating 10 ml of the reagent solution (4 fold concentration) with 1 to 9 ml of copper solution, whereafter the mixtures were diluted to 25 ml and allowed to stand for 30 minutes before measuring the colour intensity at 480 m $\mu$ . BEER's law was found to hold good at pH 3 in the range from 0.21 to 8.7 p. p. m.

**Sensitivity:** The sensitivity of the reaction (at 480 m $\mu$ ) based on an absorbance of 0.001 unit is 0.063  $\gamma/\text{cm}^2$  (SANDELL,<sup>4</sup>).

**Interference due to foreign ions:** Interference due to a number of cations and anions was studied and it was found that beryllium, thorium, iron(III), cobalt, uranium, palladium, oxalate, citrate, tartrate interfere at all concentrations while most other common ions do not interfere if present in amounts less than 30 p. p. m.

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<sup>4</sup>) E. B. SANDELL, Colorimetric determination of traces of metals 2nd Ed., New York, Interscience 1950.

Allaha bad (India), Chemical Laboratories, University of Allahabad.

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