Spectrophotometric Determination of m-Phenylenediamine

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With 2 Figures

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During a systematic study of color reactions, it was found that a mixture of chloranil and cupric chloride-triphenylphosphine complex in acetone gives pinkish red color with m-phenylenediamine. Reference to the literature indicates that this color reaction has not been reported previously.

This reaction provides the basis of a new spectrophotometric method for the determination of m-phenylenediamine in minute quantities. o-, and p-phenylenediamines which give yellow and yellowish brown color with the color producing reagent do not interfere with the m-phenylenediamine determination if their amount does not exceed 90 and 7% respectively. The maximum tolerable limit of other amines which respond to this color reaction are also reported.

Experimental

Reagents

All reagents were of analytical grade or comparable purity.

Cupric chloride–triphenylamine complex was prepared as described in previous paper.

m-Phenylenediamine solution was made by weight in acetone.

150 mg of chloranil is dissolved in 100 ml of acetone. Similarly 100 mg of cupric chloride–triphenylphosphine complex is dissolved in 100 ml acetone. Mixture prepared by mixing equal volumes of both the solutions was used as a color producing reagent.

Apparatus

All absorbance measurements were made by SP 600 Unicam spectrophotometer using 1-cm cells. The pH meter was a Pye Dynacap, and graduated pipettes, accurate to ± 0.005 ml were used.
Procedure

To a 2 ml solution containing 10 to 1000 μg of m-phenylenediamine, 5 ml of the color producing reagent is added and the solution is placed for 15 minutes at room temperature (30–32°C). The solution is then diluted to 10 ml with acetone and absorbance of pink red color is measured within 30 minutes at 520 nm using SP 600 Unicam spectrophotometer and 1-cm cells. By repeating the experiment with different amounts of m-phenylenediamine, a calibration curve is prepared. A typical calibration curve is shown in Fig. 1. The reaction obeys Beer’s law.

![Typical calibration curve for m-phenylenediamine](image)

Results and Discussion

Chloranil alone gives pink red color with m-phenylenediamine which immediately disappears. However, mixture of chloranil and cupric chloride–triphenylphosphine complex produces stable color with m-phenylenediamine having 1 μg/ml as visual limit of identification and maximum absorbance at 425 nm and 520 nm. All absorbance measurements for the determination of m-phenylenediamine were made at 520 nm. o- and p-phenylenediamines also give yellow and yellowish brown color having maximum absorbance at 420 nm and 375 nm and visual limit of identification as 60 and 5 μg/ml respectively. However, o- and p-phenylenediamines do not interfere with the determination of m-phenylenediamine if their amount does not exceed 90 and 7% respectively. The absorption