

Indian Standard

**METHODS FOR
MEASUREMENT OF AIR POLLUTION**

PART XX CARBON DISULPHIDE

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

METHODS FOR MEASUREMENT OF AIR POLLUTION

PART XX CARBON DISULPHIDE

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Indian Standard
**METHODS FOR
MEASUREMENT OF AIR POLLUTION
PART XX CARBON DISULPHIDE**

0. FOREWORD

0.1 This Indian Standard (Part XX) was adopted by the Indian Standards Institution on 20 May 1982, after the draft finalized by the Air Quality Sectional Committee had been approved by the Chemical Division Council.

0.2 Carbon disulphide is toxic and harmful to the human system by inhalation of its vapours, by prolonged or repeated contact of the liquid with the skin, or by ingestion. Acute poisoning may result by inhalation of high concentration of carbon disulphide vapours. Carbon disulphide poisoning generally occurs as a result of continued exposure to a relatively small concentration of the vapours, and the signs and symptoms are the result of injury to the nervous system. Symptoms of poisoning include nervousness, headaches, indigestion, fatigue, shortness of breath, etc. Signs of chronic poisoning by carbon disulphide vapours are waxy pallor, low blood pressure, defective memory, signs of injury to the nervous system and, in extreme cases, a masklike face and loss of control of normal body facilities.

0.3 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard (Part XX) prescribes a method for the measurement of carbon disulphide in air.

2. PRINCIPLE AND APPLICABILITY

2.1 Carbon disulphide vapours are collected by bubbling air through an ethanolic absorbing solution containing diethyl amine, triethanol amine and copper acetate. Carbon disulphide thus absorbed reacts with

*Rules for rounding off numerical values (revised).

diethanol amine and cupric ion to form a stable brownish yellow copper diethyl dithiocarbamate complex. The intensity of the colour produced is measured spectrophotometrically by reading the absorbance at 430 nm.

2.2 This method is applicable to sampling periods of 2 to 3 hours at the sampling rate of 60 ml per minute in the field conditions.

2.3 The efficiency of trapping of carbon disulphide at the flow rate indicated is 95 percent.

3. RANGE AND SENSITIVITY

3.1 The method is sensitive in the concentration range of 0.5 to 15.0 $\mu\text{g/ml}$ of absorbing solution. With 10 ml sampling solution at a flow rate of 60 ml per minute the range of concentrations of carbon disulphide that may be measured in air is 600-21 000 $\mu\text{g/m}^3$ (0.2-7.0 ppm).

4. INTERFERENCE

4.1 The interference due to hydrogen sulphide is removed with a pre-filter consisting of cotton wool impregnated with lead acetate suitably inserted in a polythene tubing attached to the impinger inlet.

5. APPARATUS

5.1 Impinger — A suitable impinger tube [see IS : 5182 (Part V) - 1975*]. The lead acetate prefilter attachment is to be connected at the impinger inlet.

5.2 Spectrophotometer — Standard spectrophotometer capable of measurements in the visible region with a band width of approximately 10 nm or a colorimeter with a suitable filter giving the spectral transmission at 430 nm.

6. REAGENTS

6.1 Absorbing Reagent — Add one ml of diethyl amine, 20 ml of triethanol amine and 50 mg of copper acetate to about 700 ml of distilled ethyl alcohol and mix well till copper acetate is completely dissolved. Make up the volume to one litre with distilled ethanol.

6.2 Lead Acetate Cotton Wool — Dissolve 10 g of lead acetate in distilled water, acidify the solution slightly with acetic acid, add 20 g of glycerine and dilute with distilled water to 100 ml. Immerse cotton wool in the solution, allow the excess liquid to drain off, press and dry at

*Methods for measurement of air pollution: Part V Sampling of gaseous pollutants.

room temperature in air free from hydrogen sulphide. Store in dry, well stoppered glass bottles. Insert the 2 cm depth of impregnated cotton wool inside a polythene tube of internal diameter 6 mm (6 cm in length).

6.3 Standard Carbon-Disulphide Solution — To prepare stock solution of carbon disulphide, measure 0.1 ml of AR grade carbon disulphide (sp- gr 1.2626) in 50 ml stoppered flask containing about 10 ml of ethyl alcohol. Weigh the flask on an analytical balance before and after adding carbon disulphide. Dilute the carbon disulphide solution to the calculated volume so as to get one ml of stock solution equivalent to 2.5 mg of carbon disulphide. To prepare a standard solution dilute one ml of the stock solution to 100 ml with ethanol (1 ml equivalent to 25 μg).

7. PROCEDURE

7.1 Assemble the sampling train [see IS : 5182 (Part V)-1975*].

7.1.1 If a pump is not available, a suitable aspirator system may be used.

7.1.2 Calibrate the aspirator bottle by measuring the drained out water at each 500-ml mark. Mark 0 at the starting level and 1, 1.5, 2.0, and so on (in litres) at respective decreasing levels.

7.1.3 Take 10 ml of the absorbing solution in the impinger. To the inlet of the impinger attach the hydrogen sulphide trapping cotton wool. Connect the impinger tube to the aspirator bottle filled with water up to 0 mark. Adjust the rate of drainage of water to 60 ml per minute by means of a screw clip. Aspirate the air to 7 or 8 litres mark.

7.2 Analysis — Transfer the sampled carbon disulphide to a 10 ml flask, rinse and make up the volume to 10 ml mark with sampling solution. Read the absorbance at 430 nm wavelength against absorbing solution serving as a reagent blank.

8. CALIBRATION CURVE

8.1 Into a series of 10 ml standard flasks add 0, 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 ml of standard solution (1 ml = 25 μg carbon disulphide). Dilute them to mark with absorbing solution and mix well. Allow the mixture to stand for 20 minutes to develop full colour. Read respective absorbance value at 430 nm wavelength. Plot a curve of absorbance values against carbon disulphide concentrations.

*Methods for measurement of air pollution : Part V Sampling of gaseous pollutants.

8.2 Note the mass of carbon disulphide from the calibration curve and the volume of air sampled using a calibrated flowmeter or as noted by the amount of water drained out from the aspirator bottle.

9. CALCULATION

9.1 Calculate the concentration of carbon disulphide as follows:

$$\text{Concentration of carbon disulphide in } \mu\text{g/l} = \frac{M}{V}$$

where

M = mass of carbon disulphide, μg ; and

V = volume of air sampled, in litres.

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