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RESEARCH ARTICLE

EXPLORATION ON MOISTURE CONTENT PERCENTAGE IN SODIUM CHLORIDE USING KARL FISCHER APPARATUS AND SULFATE ION CONCENTRATION BY NEPHLOMETRY

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ABSTRACT:

The Karl Fischer titration method is available for the determination of moisture. The water content in chemicals, drugs and pharmaceuticals can be readily determined by titration with Karl Fischer reagent which contains iodine sulphur dioxide, anhydrous methanol and anhydrous pyridine. Nephlometry is the measurement of scattered light as a function of concentration of suspended particles (less than, approx. 100mg/litre). At low concentration of a suspensions, there is uniform scattering. Hence the intensity of scattered light is proportional to the concentration. The present work showed the estimation of moisture content percentage in sodium chloride using Karl Fischer titration apparatus and to determine the sulfate ion concentration in tap water by using nephlometry.

KEYWORDS: Karl Fischer, Sodium Chloride, Moisture, Nephlometry, Sulfate ion, Intensity.

INTRODUCTION:

In 1935, Karl Fischer proposed a reagent prepared by the action of sulphur dioxide on solution of iodine in a mixture of anhydrous pyridine and anhydrous methanol or another suitable solvent [1]. The reagent decomposes on standing, hence should be standardized frequently. For aldehyde and ketones, specifically formulated reagents are available commercially [2]. Nephelometric analysis is based on the measurement of the intensity of scattered light as a fraction of the concentration of the dispersed phase [3]. In nephelometry, light is allowed to pass direct through the sample solution having suspended particles [4]. The amount of radiation scattered by the particles is measured at an angle (90^0) to incident beam. NaCl and HCl acid is added to check growth of microcrystals of barium sulphate [5]. Glycerol-ethanol is added to stabilize turbidity. Barium chloride is added to produce turbidity by producing barium sulphate.

MATERIALS AND METHODS:

(I) MOISTURE CONTENT PERCENTAGE IN SODIUM CHLORIDE USING KARL FISCHER APPARATUS:

Materials:

A EI Karl Fischer titrimetric apparatus (Model, 761E, automatic) with dual platinum electrode was used for accurate determinations of moisture content in chemicals. The Karl Fischer reagent, distilled water, sodium chloride, methanol etc. was used for this study. All the chemicals used were of analytical grade.

Methods:

Firstly, electrical flow was given in the apparatus and takes the Karl Fischer reagent in a burette and mixture of 1:1 ratio distilled water and methanol (50 ml each) in the Karl Fischer container.

Start titration till the end point was obtained. The buzzer was automatically switched on. The sound was occurred by the apparatus when the titration was completed. The buzzer of switch may be pressed to stop the buzzer. Now, in our next step we take the Karl Fischer reagent in a burette and mixture of 1:1 ratio distilled water and NaCl solution (50 mi each) in which 50mg NaCl in the Karl Fischer container and operate same process as mentioned earlier i.e.

Step I: 50 ml methanol+ 50ml distilled water.

Step II: 50 ml NaCl solution (Present 50mg NaCl) + 50ml distilled water.

(II) SULFATE ION CONCENTRATION BY NEPHLOMETRY:

Materials:

Potassium Sulfate, Sodium Chloride, Hydrochloric acid, Glycerol, Ethanol, Barium chloride, Distilled water, Nephlometer. All the chemicals used were of analytical grade. The standard sulfate solution was prepared for this study.

Methods:

0.5, 1, 1.5, 2.0, 2.5, 3.0,3.5, 4 ml of standard K_2SO_4 solution were transferred from burette into each separate 100 ml volumetric flask & number them from1 to 8.To each flask pipette out 10 ml NaCl-HCl reagent and 20 ml of glycerol–ethanol solution , dilute to 100 ml distilled water. 0.3 gm of BaCl2 was weighed to each flask. Stopper them and shake for exactly 1 min by inverting flask once in a second. Permit each flask to stand for 2-3 mins and read out the turbidity in the nephelometer. By employing the concentrated K_2SO_4 solution as standard and by the help of sensitivity control adjust the micrometer reading into 100 divisions. A blank solution is prepared by adopting the above option sequence but without the addition of K_2SO_4 solution. Insert the blank solution in the nephelometer and adjust zero. Without disturbing the sensitivity controller, record the reading for different concentration of standard solution.

RESULTS AND DISCUSSION:

(I) MOISTURE CONTENT PERCENTAGE IN SODIUM CHLORIDE USING KARL FISCHER APPARATUS:

Now, we can calculate the percentage moisture content in the following formula:

% moisture content

= K.F (ml) x MDF x100/ Weight of the sample

[MDF = Moisture Determining Factor of K.F, KF (ml)]

From the step I, required 5 ml Karl Fischer reagent in which 1 ml K.F reagent sucks 10ml distilled water.

From the step II, required 6 ml Karl Fischer reagent in which it fully sucks 60ml distilled water.

10ml of KF reagent was consumed when 50 mg NaCl was used.

50 mg of NaCl was having 15.66 x 50 of moisture/ 100

Thus, each ml of reagent was capable of 100 removing 7.83 mg of moisture.

Then, MDF value of the reagent was 7.83.

[As mg of H20/ml of K.F = mg of sample x 0.1566 /mg of reagent K.F]

The percentage of moisture content in sodium chloride

= K.F (ml) x MDF x100/ Weight of the sample (mg)

= 6x 7.83x100/50 =93.96%

(II) SULFATE ION CONCENTRATION BY NEPHLOMETRY:

Table 1: Nephelometer reading Vs. Sulfate ion concentration:

Concentration	NTU
0.00	0
0.50	12
1.00	25
1.50	38
2.00	50
2.50	63
3.00	75
3.50	87
4.00	100

Now it was observed that, for test solution NTU=22

Concentration at 22 NTU= 8.75 ppm

CONCLUSION:

(I) MOISTURE CONTENT PERCENTAGE IN SODIUM CHLORIDE USING KARL FISCHER APPARATUS:

The present study showed that the estimation of moisture content percentage in sodium chloride was 93.96% using Karl Fischer titration apparatus.

(II) SULFATE ION CONCENTRATION BY NEPHLOMETRY:

The study was based on the measurement of the intensity of scattered light as a fraction of the concentration of the dispersed phase. In this study, it was observed that tap water contains 8.75µg/ml or 8.75ppm of sulfate ion by using nephelometry.

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