

Exp. no 2

25/9/07

ASSAY OF ASCORBIC ACID

Aim

To carry out the assay of ascorbic acid

Chemicals requirements

Ascorbic acid, starch indicator, 0.1N Iodine solution
Dil. Sulphuric acid.

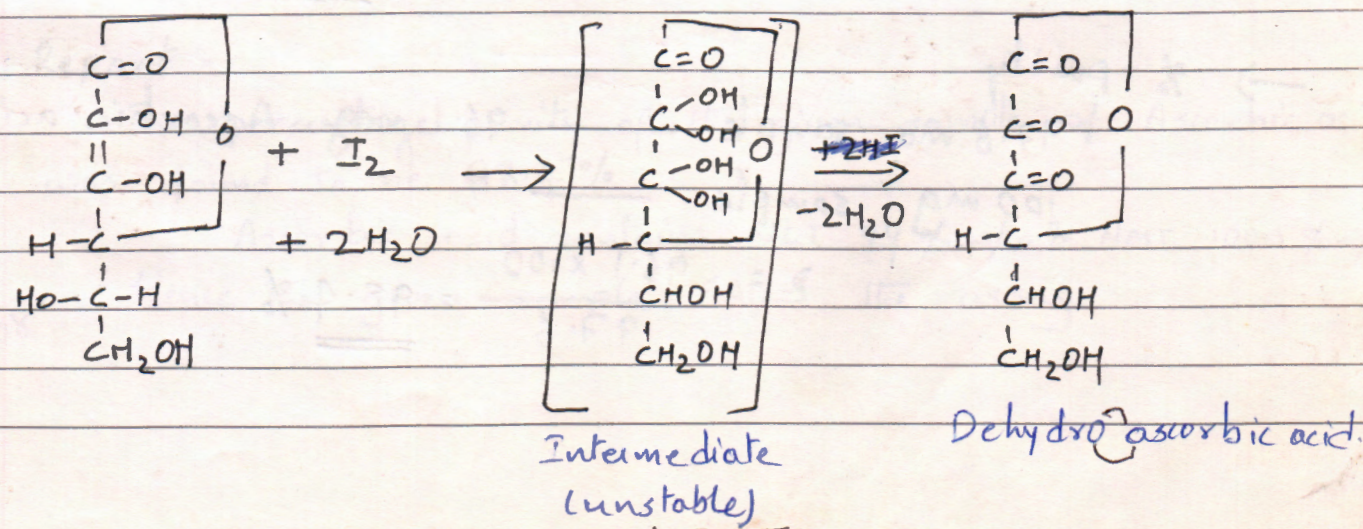
Apparatus

Burette, Conical flask, Measuring cylinder

Principle

The determination depends upon the quantitative oxidation of Ascorbic acid to dehydroascorbic acid with Iodine solution. Iodine acts as an oxidising agent and oxidises ascorbic acid to dehydroascorbic acid. In this process it gets reduced to hydrogen iodide. This is an IODIMETRIC type of titration i.e., titration with iodine directly

End point is detected using starch solution as indicator



Note:

- Ascorbic acid is vitamin-C. It is a water soluble vitamin. It has two enolic OH group on C_2 and C_3 . It is not an acid but acidic because of enolic '-OH' groups.
- Out of the two enolic hydroxyl groups the one on C_3 is more acidic. Because it is acidic, Ascorbic acid forms salts with bases.
- Sodium ascorbate is a commonly used salt in which 'Na' atom replaces the hydrogen of 'OH' on C_3 .
- We use freshly boiled and cooled water in order to remove oxygen present in water else the dissolved oxygen may oxidise a certain amount of Ascorbic acid.

Procedure

About 0.1g of Ascorbic acid was accurately weighed and dissolved in a mixture of 100ml of freshly boiled & cooled water and 25ml of dil. sulphuric acid.

It was immediately titrated with 0.1N I_2 solution using starch as an Indicator as the end point is clear.

Each ml of 0.1N $I_2 \cong 0.008806$ gms of Ascorbic acid ($C_6H_8O_6$)

Report

The percentage purity of the given sample of Ascorbic acid was found to be 98.4%

Ascorbic acid contains NLT 99% w/w & NMT 100.5% w/w

Hence the given sample FAILS the assay

7/3/08

1) Why starch solution is used as an indicator in this titration? Why Iodine is not used as a self-indicator?

The end product, dehydro ascorbic acid, is yellow in colour and Iodine solution is also yellowish brown. Hence at the end point, it is not known if the yellow colour is due to extra drop of Iodine or the end product. So starch solution is used as an indicator which gives blue at the end point.

2) Is the reaction Iodimetry (or) Iodometry?

The assay of Ascorbic acid is an iodimetric type of titration since it involves direct titration with Iodine.

In Iodometry, iodine is not used directly but the liberated Iodine is estimated.

3) What is the use of Ascorbic acid?

Ascorbic acid is used in the treatment of SCURVY

It is also used as an antioxidant.

4) Why is the equivalent weight of Ascorbic acid half its mol. wt?

In the reaction, ascorbic acid is oxidised to dehydro ascorbic acid by the removal of two hydrogen atoms. Hence the equivalent weight of ascorbic acid is half its molecular weight.

5) Why should we do the titration quickly?

In order to prevent the atmospheric oxidation of Ascorbic acid to dehydro ascorbic acid, the titration is done quickly.

6) Why starch solution is added only at the near end point?

Starch iodine complex has high dissociation constant and the blue colour is not discharged easily. If used initially, there occurs reaction between Iodine & starch instead of Iodine and ascorbic acid as it is not a strong reducing agent. And give a FALSE end point

CALCULATIONS

→ weight of Ascorbic acid

$$\text{weight of paper + sample} = 337.6 \text{ mg}$$

$$\text{weight of paper after transfer} = 239.8 \text{ mg}$$

$$\text{weight of sample transferred} = 97.6 \text{ mg}$$

→ Burette reading

S.NO	Initial	Final	Volume of I_2 consumed
1	0	10.4	10.4 ml

→ wt. of ascorbic acid present in sample taken

$$\text{for analysis} = \frac{\text{Titre value} \times \text{Normality} \times \text{factor}}{0.1}$$

$$= \frac{10.4 \times 0.105 \times 0.008806}{0.1}$$

$$= 0.0961 \text{ mg} = \underline{\underline{96.1 \text{ mg}}}$$

→ % purity

$$\begin{array}{l} 97.6 \text{ mg sample} \text{ ————— } 96.1 \text{ mg Ascorbic acid} \\ 100 \text{ mg sample} \text{ ————— } ? \end{array}$$

$$x = \frac{96.1 \times 100}{97.6} = \underline{\underline{98.4\%}}$$