

Sheet No.

GT200-ME028E Oil

## Determination of purity of L (+)-ascorbic acid—1/4

|                  |   |
|------------------|---|
| Method           | : Oxidation-reduction titration   |
| Apparatus        | : Automatic Titrator Model GT-200 (GT0EF)<br>Electrodes: Reference electrode, double junction (GTRE10B)<br>*Inner solution: 1mol/l Potassium chloride<br>*Outer solution: 1mol/l Potassium nitrate<br>Platinum electrode (GTPT1B) |
| Titration mode   | : INF, Detection: mV  |
| Related standard | : Japanese Pharmacopoeia. Ascorbic acid/Quantitative method<br>Seiji Takagi. Quantitative analysis: Experiments and calculation, Vol.2: Volumetric analysis. Kyoritsu Shuppan   |

\*This application sheet is provided as reference, and does not assure the measurement results. Please consider analysis environment, external factors and sample nature for optimal conditions before the measurement.

### Outline

L(+)-ascorbic acid (vitamin C) is used for products such as antioxidant for food, dietary supplements and medicines. Purity of L(+)-ascorbic acid is measured by oxidation-reduction titration using a platinum detection electrode.

### Reagents

[ Titration solution ]

■0.05mol/L-iodine in water (Volumetric analysis grade)

[ Adjustment reagents ]

■Metaphosphoric acid in water ... Dissolve 1g metaphosphoric acid in pure water to 50ml total.

[ Reagents for standardization ]

■0.1mol/L-sodium thiosulfate in water (Volumetric analysis grade)

### Analytical Procedure

[ Standardization of titer of iodine solution using sodium thiosulfate solution ]

- (1) Collect 10ml of 0.1mol/L-sodium thiosulfate solution (volumetric analysis grade) with a whole pipette and add it into a 100ml beaker.
- (2) Add approximately 50 ml pure water and titrate with 0.05mol/L-iodine solution.

[Calculation for standardization of titer]

**Factor of iodine solution (f) =  $S \times K1/A1 \times 10$**

S : Collection quantity of 0.1mol/L-sodium thiosulfate (ml)

K1 : Molar concentration of 0.1mol/L-sodium thiosulfate . Factor

A1 : Titration volume of 0.05mol/L-iodine solution at the time of standardization of titer (ml)

Sheet No.

**GT200-ME028E Determination of purity of L(+)-ascorbic acid** 2/4

[ Purity test of L(+)-ascorbic acid ]

- (1) Accurately weigh 0.2g of L(+)-ascorbic acid in a 100ml beaker.
- (2) Collect 50ml metaphosphoric acid\* solution using a measuring cylinder and add it into the beaker.
- (3) Agitate the solution to completely dissolve the L(+)-ascorbic acid.
- (4) Titrate with 0.05mol/L-iodine solution.

The metaphosphoric acid\* solution turns gradually into orthophosphoric acid which serves as a stabilizer to prevent vitamin C from being oxidized by air.

[ Calculation ]

**Purity of L(+)-ascorbic acid (%) = (A1 - BL) x M x E x f x FW/S x R/10** (Use fixed calculation formula)

- A1 : Titration volume of 0.05mol/L-iodine solution until an inflection point (ml)  
 BL : Blank (0 because no blank measurement is conducted.)  
 M : Molar concentration of 0.05mol/L-iodine solution (0.05)  
 E : Equivalent number of 0.05mol/L-iodine solution (2Eq)  
 FW : Quantity of ascorbic acid equivalent to one equivalent of iodine (88.06g/Eq)  
 S : Sample volume (g)  
 R : Dilution ratio (1)

### Other Requirements

- Polish the surface of the platinum detection electrode very lightly using cleanser or the like.
- Make sure to confirm labels and safety data sheets of reagents and gases used for the measurement and handle them with enough care.
- Wear protective equipment (eye protector, gloves and others) when handling reagents. Measurement results

### Measurement Results

|   | Sample size (g) | Titration Volume (ml) | Results (%) |
|---|-----------------|-----------------------|-------------|
| 1 | 0.2077          | 23.3100               | 100.1       |
| 2 | 0.2055          | 23.0576               | 100.1       |
| 3 | 0.2025          | 22.7372               | 100.2       |

Nos. of data (n) 3  
 Average 100.1  
 Standard deviation (SD) 0.04  
 Relative standard deviation (RSD%) 0.04

Purity of L(+)-ascorbic acid was measured. The value measured by GT-200 was 100.1% and the relative standard deviation (RSD %) was 0.04%. GT-200 can measure the purity of L(+)-ascorbic acid with good repeatability.

Sheet No.

GT200-ME028E Determination of purity of L(+)-ascorbic acid

3/4

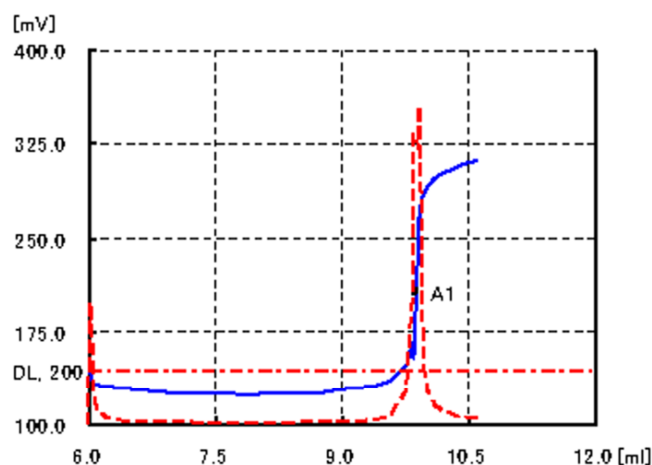
ID No. : 33 GTNo.1

Measurement : 2014/11/28 11:43

Sample name : 0.05M-I2

Type : Sample Titr

Sample size (S) : 10 [ml]



C1 : 1.0125 [f]

A1 : 9.8768 [ml] 207 [mV]

Initial potential (Pi) : 278 [mV]

Start : 6 [ml] 149 [mV]

End : 10.6 [ml] 312 [mV] Time : 5'9"

Run file No. : 21

Titration file No. : 6

\*Run file and Titration file parameters are set for each analysis item.

Mode : INF End1, End1 Width : 250 [mV] ± 500 [mV]

Detect : mV1

BRT No. : 1 Preset 1 Mode : V BRT : 1

Reagent : 15 Volume : 6 [ml]

WTint : 10 [sec]

Vup : 200 [ul]

Vlow : 10 [ul]

dE : 3 [mV]

dT : 5 [sec]

DL : 200 [mV/ml]

DetCnt : 10

Vmax : 20 [ml] C1 : S\*K1/A1\*10

Vover : 0.5 [ml]

[f]

Reagent name (Reag) : I2

Equivalent (E) : 2

Molarity(M) : 0.05 [Mol/l]

Factor (f) : 1

Coefficient1(K1) : 0.1

Buret Injection Speed : 500 [ul/sec]

Sheet No.

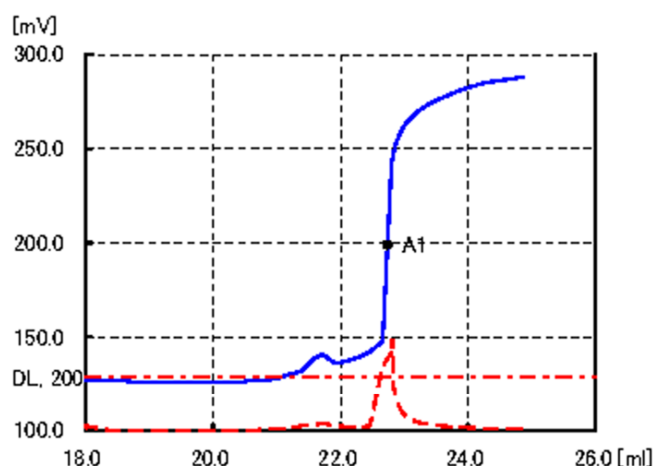
GT200-ME028E Determination of purity of L(+)-ascorbic acid 4/4

ID No. : 3 GT No.1

User : GT-200

Measurement : 2014/12/01 12:02  
Sample name : L(+)-ascorbic acid

Type : Sample Titr  
Sample size(S) : 0.2025 [g]



C1 : 100.161 [%]

A1 : 22.7372 [ml] 199 [mV]

Initial potential (Pi) : 176 [mV]

Start : 18 [ml] 128 [mV]  
End : 24.866 [ml] 288 [mV] Time : 7'46"

Run file No. : 18 Purity of L(+)-ascorbic acid

Titration file No. : 52 Purity of L(+)-ascorbic acid

\*Run file and Titration file parameters are set for each analysis item.

Mode : INF End1, End1 Width : 250 [mV]  $\pm$  500 [mV]

Detect : mV1

BRT No. : 1

Preset1

Mode : V

BRT : 1

Reagent : 28

Volume

: 18 [ml]

WTint : 10 [sec]

Position

: Titration

Vup : 200 [ $\mu$ l]Vlow : 10 [ $\mu$ l]

dE : 3 [mV]

dT : 5 [sec]

DL : 200 [mV/ml]

DetCnt : 15

Vmax : 50 [ml]

C1 : (A1-BL)\*M\*E\*f\*FW/S\*R/10

Vover : 0.5 [ml]

[%]

Reagent name (Reag) : I2

Equivalent (E) : 2

Molarity(M) : 0.05 [Mol/l]

Factor (f) : 1.013

Blank (BL) : 0 [ml]

Formula weight (FW) : 88.06

Dilution rate (R) : 1

Buret Injection Speed : 500 [ $\mu$ l/sec]