

Seasoning

Acid Degree of Concentrated Lemon Juice

Acid-base titration by
Automatic Potentiometric Titrator

Standard

Japanese Agricultural
Standards

1. Abstract

Determination of acid degree of fruit juice is popularly practiced by potentiometric acid-base titration using a glass electrode based on Japanese Agricultural Standards.

After pure water is added, titrate with 0.1mol/L sodium hydroxide up to pH8.3, and the titration volume is converted to citric acid.

Sample juice with granular pulp requires filtering.

2. Reference

- 1) JAS specification for measurement of fruit drink (Bulletin No. 1225 noticed by Ministry of Agriculture, Forestry and Fisheries, September 29, 1997)

3. Cautions in measurement

- 1) Handle with care when work on chemicals.
- 2) If acidity is high, use a fixed dose mode to shorten measuring time.
- 3) Use pure water for dilution without ambient carbonic gas dissolved in.
- 4) Filter sample juice if it contains granular pulp. Otherwise, measurement may result with poor repeatability.

4. Post-measurement care

After the electrode is rinsed with pure water, keep its tip dipped in a beaker filled with pure water in order to avoid it from drying up.

5. Test equipment

Main unit : Automatic potentiometric titrator (Standard preamplifier: STD-)
Electrode : Standard Combination glass electrode
 Standard Temperature compensation electrode

6. Reagent

Titrant : 0.1mol/L Sodium hydroxide (f=0.9980)
Additive : Pure water

7. Measurement procedure

—Measurement—

- 1) Deliver approximately 5g sample into a 200mL beaker.
- 2) Add pure water to make it 100mL in total.
- 3) Titrate with 0.1mol/L sodium hydroxide to obtain acid degree.

8. Formula

Acid degree (Citric acid w/w%) = (EP1 - BLK) × F × C1 × K1 / SIZE

EP1 : Titration volume (mL)
BLK : Blank level (0.0427mL)
F : Factor of titrant (0.9980)
C1 : Concentration conversion coefficient (6.4 mg/mL)
 (Citric acid ≡ 6.4mg equivalent to 1mL of 0.1mol/L NaOH)
K1 : Unit conversion coefficient (0.1)
SIZE : Sample size (g)

9. Example of measurement

— Ambient condition —

| | | |
|----------------------------|-----------------|------------------|
| Room temperature : 25.0 °C | Humidity : 57 % | Weather : Cloudy |
|----------------------------|-----------------|------------------|

- Titration parameter -

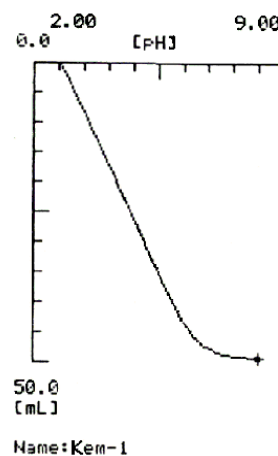
| | | | |
|-----------------------|---------------------|---------------------------|---------------------|
| Model : AT-500N | Method No. : 04 | Titr.mode : Auto Intermit | Titr.form : Level |
| [Titration parameter] | | | |
| Titr.Form : Level | Buret No. : 1 | Preamp : STD | Detector No. : 1 |
| Unit : pH | Max.Volume : 60.0mL | Titr. Wait : 0s | Direction : Auto |
| [Control parameter] | | | |
| 1st Level : 8.3 pH | 2nd Level : 8.3 pH | Gain : 1 | Ctrl Speed : Medium |
| Sampling mV : 4.0mV | Sampling mL : 0.5mL | | |

- Titration curve -

| | |
|--------------------|----------------------|
| <Calculation> | |
| Sample Measurement | |
| Conc. 1 | Calculation No. : 05 |
| End Point No. : 1 | Unit : [%] |
| Coefficient1 : 6.4 | Blank1 : 0.0427mL |
| Factor1 : 0.9980 | EP Data : Epn-Blank |

*** Result ***

| | |
|-------------------------|-------------------------|
| Sample No. : 05-04 | Date : 1999/06/18 14:41 |
| Sample ID : | Method No. : 04 |
| <Auto intermit> | |
| Method Name : | |
| I.Level : 2.74pH | I.Temp : 24.9C |
| Titr. Time : 00:11:05 | |
| Size : <u>4.999g</u> | |
| Conc-1 : <u>6.3160%</u> | |
| EP-1 : <u>49.4754mL</u> | 8.30pH |



(The above test results were printed out from titration by AT-500N unit.)

«Titration parameter»

Form: of titration / APB No. the burette used in titration / Unit No.: [APB Unit File number](#)
 Detector No.: the detector used in titration / Max Volume. of titration / Wait Time: before titration starts
 Direction.: of titration

«Control parameter»

1st Level potential at EP1/ / 2nd Level: potential at EP2/Gain: sensitivity of detection signal
 Ctrl Speed: control of speed / Sampling mV: sampling potential / Sampling mL: data sampling volume

«Result parameter»

Calc No.: formula of conc.1/ End Point No. EP order for concentration 1/Unit conversion unit
 Temp.Comp.: temperature compensation of titration liquid/ C1(mg/mL): [concentration conversion coefficient](#)
 K1: unit conversion coefficient /Factor: of reagent / Blank1: blank level 1/ EP Data: titration volume formula

–Measurement results–

| n | Sample (g) | Titration (mL) | Acidity (w/w%) | Statistics | |
|---|---------------|-------------------|-------------------|------------|----------|
| | | | | Mean | |
| 1 | <u>4.999</u> | <u>49.4754</u> | <u>6.3160</u> | Mean | 6.3165 % |
| 2 | 4.994 | 49.4444 | 6.3184 | SD | 0.0017 % |
| 3 | 4.998 | 49.4588 | 6.3151 | RSD | 0.0270 % |

* The above results were obtained by 3 tests of the same sample.

* Red underline shows the data from page 3/4.

10. Summary

The concentrated fruits juice is a kind of juice reduced from concentration by adding water. Most of fruits juice sold in the market is made from concentration.

Simply described Acidity means the concentration of organic acid.

The sample measurement shows a good repeatability with 0.03% relative standard deviation. Precise and reliable measurement is assured by the automated potentiometry.