**Application Note**

# Measuring the acidity of fruit beverages using a multiple sample changer

| | |
|---|---|
| Industry | Food & beverage |
| Instrument | Automatic potentiometric titrator |
| Measurement method | Potentiometric titration / Neutralization titration |
| Standards | - |

## 1. Scope

Fruit beverages contain citric acid, malic acid, and other organic acids. The acidity indicates the amount of these organic acids. In fruit beverages, the ratio of acidity to sugar content has a significant effect on the preference and flavor. Accordingly, it is very important to control the acidity in order to manufacture beverages of consistent quality.
This Application Note describes an example of the measurement of the acidity of a fruit beverage (from mandarin oranges). Note that the measurements were performed using a multiple sample changer. Multiple beakers containing the samples were placed on a turntable, enabling consecutive measurements to be performed automatically. In this test, the measurements were performed with the parameter settings configured so that a pH of 8.0 was detected as the end point.

## 2. Post-measurement procedure

To suppress efflux and enrichment of the electrolyte when storing the electrodes, seal the electrolyte filling port in the combined glass electrode with a rubber stopper.
The performance of the combined glass electrode quickly deteriorates if it is stored while dry. The following storage methods are recommended.

- Short-term storage (less than one month): Store in pure water.
- Long-term storage (one month or longer): Store in a mixture of pH4 standard solution and 3.3 mol/L potassium chloride solution in a 1:1 volume ratio.

## 3. Apparatus

- Automatic potentiometric titrator (preamplifier STD)
- Multiple sample changer
- Combined glass electrode (Electrolyte: 3.3 mol/L potassium chloride solution)
- Temperature compensated electrode

## 4. Reagents

Titration liquid　0.1 mol/L sodium hydroxide solution
Others　Standard solutions at a pH of 7 and 9

## 5. Procedure

1) Calibrate the combined glass electrode using the standard solutions at pH 7 and 9.
2) Introduce the sample into a beaker and weigh it.
3) Using a measuring cylinder, add 100 mL of pure water, and place the beaker in the multiple sample changer.
4) Titrate with a 0.1 mol/L sodium hydroxide solution, with a pH of 8.0 as the end point.

## 6. Calculation

Acidity (%)* = (EP1 - BL1) × TF × 6.404 × 0.1/S

EP1 Titration volume (mL)
BL1 Titration volume (mL) for a blank test = 0
TF Titration liquid factor = 0.9920
S Amount of sample introduced (g)

* Calculated as the mass percent concentration of citric acid

## 7. Example

—Titration parameter—

| | |
|---|---|
| **<Titr. Mode>** | Auto Int. |
| **<Titr. Form>** | Level Stop |

**<Titr. Para.>**

| | |
|---|---|
| Max Volume | 20(mL) |
| Channel/Unit(Ctrl.) | Ch1, pH |
| Channel/Unit(Ref.) | Off |
| pH Polarity | Standard |
| Titr. Type Check | No Check |
| Direction | Auto |
| Wait Time | 0 (s) |
| Dose Mode | None |

**<Sample Changer>**

| | |
|---|---|
| Shower | 15s |
| Drain | 30s |

**<Ctrl. Para.>**

| | |
|---|---|
| Number of EP | 1 |
| 1st End Level | 8.0 pH |
| Gain | 1 |
| Data Sampling | Auto |
| Ctrl. Speed | Standard |
| Other Control | Standard |
| Auto Int. Mode | Standard |
| Stirrer Speed | 4 |

(The above condition is an example. The setting condition depends on the model.)

—Titration curve—

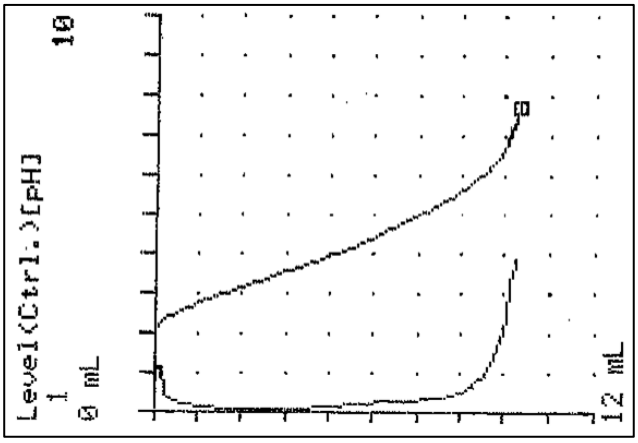


Table 1 Measurement result

| | Sample (g) | Titration amount (mL) | Acidity (%) |
|---|---|---|---|
| 1 | 10.1474 | 9.9927 | 0.626 |
| 2 | 10.0642 | 9.9089 | 0.625 |
| 3 | 10.2621 | 10.0971 | 0.625 |
| 4 | 10.1302 | 9.9625 | 0.625 |
| 5 | 10.5239 | 10.3445 | 0.624 |
| 6 | 10.1199 | 9.9523 | 0.625 |
| 7 | 10.4572 | 10.2788 | 0.624 |
| 8 | 10.2777 | 10.1057 | 0.625 |
| 9 | 10.7381 | 10.5577 | 0.625 |
| 10 | 10.1543 | 9.9836 | 0.625 |
| Mean | – | – | 0.625 |
| SD | – | – | 0.0004 |
| RSD(%) | – | – | 0.065 |

## 8. Summary

Acidity measurements were performed using an automatic potentiometric titrator. In this test, a multiple sample changer was used to perform a consecutive series of measurements automatically. Using a multiple sample changer makes it possible to reduce the labor required for the measurements and improve efficiency.