Determination of acidity/acid degree in milk and milk products
Use

This method is used for the quantitative determination of acidity (acid degree) in milk and milk products. The acidity is calculated either as SH-, Dornic- or Therner degree. The different degree uses different concentrations of NaOH titrant.

Appliances

- Titrator: TL 6000/7000 (TL 6000/7000 M2/20) consists of
- Basic device
- Magnetic stirrer TM 235
- 20 mL Exchange unit WA 20, with brown glass bottle for titrant complete
- And pH combination electrode A 162 DIN ID

Electrodes

- Electrode: A 162 DIN ID
- Calibration: DIN buffer pH= 4.00 and pH= 7.00
Reagents

- Titrant: sodium hydroxide solution 0.1mol/l (Therner), 0.25 (SH) or 0.11 (Dornic) mol/l
- Soda lime for carbon dioxide uptake of the reagent.
- Titer: potassium hydrogen phthalate (reference material)

Description

Calibration

The pH combination electrode is calibrated in technical buffer pH=4.00 and pH= 7.00 or in DIN buffer pH= 4.01 and pH= 6.87.

Example of the calibration documentation:

**Buffers used**

| pH buffer 1 | TEC_4.000 |
| pH buffer 2 | TEC_7.000 |

**Measured values**

| pH buffer 1 | TEC_4.000 | 165.6 mV / 23.4 °C |
| pH buffer 2 | TEC_7.000 | -11.2 mV / 23.0 °C |

**Calibration data**

- Slope: 99.4 % / -58.8 mV/pH
- Zero point: pH 6.81 / -11.2 mV
- Temperature: 23.4 °C (a)
- Date and time: 07.03.13 / 15:04

Determination of the exact concentration of the standard solution

By carbon dioxide absorption from the air occurs in the sodium hydroxide solution of sodium bicarbonate, which changes the pH of the titrant. To prevent this, a drying tube filled with soda lime is placed on the reagent bottle. The exact concentration of the sodium hydroxide solution is determined using the standard potassium hydrogen phthalate. The potassium hydrogen phthalate is dried in the oven before the titer determination for 2 hours at 120°C and cooled in a desiccator.

Implementation

In a 50 mL beaker, 0.2 to 0.3g potassium hydrogen phthalate were weighed accurately and dissolved in 30 mL of dist. water with stirring. It is titrated with 0.1 mol/l sodium hydroxide solution. For 0.25 mol/l NaOH you need 0.5 – 0.75 g potassium hydrogen phthalate.
Application

Standardisation titration (result)

GLP documentation

Titrations graph

<table>
<thead>
<tr>
<th>pH/ml</th>
<th>KHPhthalat</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>1.0</td>
</tr>
<tr>
<td>3.75</td>
<td>1.25</td>
</tr>
<tr>
<td>4.5</td>
<td>2.5</td>
</tr>
<tr>
<td>5.25</td>
<td>3.75</td>
</tr>
<tr>
<td>6.0</td>
<td>5.0</td>
</tr>
<tr>
<td>6.75</td>
<td>6.25</td>
</tr>
<tr>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>8.25</td>
<td>8.75</td>
</tr>
<tr>
<td>9.0</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Method data

- Method name: Titre NaOH
- End date: 08.01.13
- Titraton duration: 2 m 15 s
- End time: 15:46:03

Titrations data

- Start pH: pH 4.065
- Start temperature: 25.0 °C (m)
- Zero point: pH 6.85 / -8.9 mV
- EQ: 10.032 ml / pH 8.498
- Mean value: ---
- Weight: 0.20490 g
- End pH: pH 9.667
- End temperature: 25.0 °C (m)
- Slope: 98.7 % / -58.4 mV/pH
- Titre: 0.1000 mol/l
- RSD: ---

Calculation formula

- Titre: \((W^*F2)/((EQ1-B)^*M^*F1) -> WA\)
- Mol (M): 204.22000
- Weight (W): 0.2049 g (m)
- Blank value (B): 0.0000 ml
- Factor 2 (F2): 1000.0000
- Factor 1 (F1): 1.0000
- Statistics: 3

Date: 28.2.2012
# Application

**Standardisation titration (method)**

## Method data

<table>
<thead>
<tr>
<th>Method name:</th>
<th>Titer NaOH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method type:</td>
<td>Automatic titration</td>
</tr>
<tr>
<td>Measured value:</td>
<td>pH</td>
</tr>
<tr>
<td>Titation mode:</td>
<td>Dynamic</td>
</tr>
<tr>
<td>Dynamic:</td>
<td>average</td>
</tr>
</tbody>
</table>

- Measuring speed / drift: Normal
- Initial waiting time: 0 s
- Titation direction: Increase
- Pretitation: Off
- End value: 10.500 pH
- EQ: On
- slope value: Steep
- Value: 700

- minimum holding time: 02 s
- maximum holding time: 15 s
- measuring time: 02 s
- drift: 20 mV/min

### Dosing parameter

- Dosing speed: 100 %
- Maximum dosing volume: 30.00 ml
- Filling speed: 30 s

### Calculation formula

\[
\text{Titer NaOH} \, 0,1 \text{mol/l} = \left(\frac{W \times F2}{((EQ1-B) \times M \times F1)}\right) \\
\text{Mol (M)}: 20.42230 \\
\text{Unit:} \\
\text{Decimal places:} 4
\]

### Weight (W): men
- Blank value (B): 0.0000 ml
- Factor 2 (F2): 1000.0000
- Factor 1 (F1): 1.0000

---

**Device information**

- Device: TitrLine 6000
- Serial number:
- Software version: 07_12

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*date: 28.2.2012*
Titration of the sample

Pipette accurately in 100 ml beaker either:
- 25 ml milk for SH degree
- 11 ml milk for Dornic degree
- 9 ml for Therner degree

Add app. 25 ml – 40 ml CO₂ free water into and mix the sample on the magnetic stirrer for a few seconds. Titrate with the suitable NaOH titrant to a fixed pH endpoint (8.2-8.7, depending on national norms).

Example
Method parameters: (optimized for SH degree)

Method data overall view

Method name: acidity in milk
Method type: Automatic titration
Measured value: pH
Titration mode: End pt.
Linear steps: 0.050 ml
Created at: 04/29/13 13:24:34
Last modification: 04/29/13 13:44:18
Damping settings: None
Documentation: GLP

Measuring speed / drift: Normal:
Minimum holding time: 02 s
Maximum holding time: 15 s
Measuring time: 02 s
Drift: 20 mV/min

Initial waiting time: 0 s
Titration direction: Increase
Pre-titration: Off

Endpoint 1:
PH 8.200
delta_endpoint: 1: pH 1.000
Endpoint delay 1: 5 s

Endpoint 2:
Off

Dosing parameters:
Dosing speed: 20.00 %
Maximum dosing volume: 50.00 ml
Filling speed: 30 s

Unit values
Unit size: 20ml
Unit ID: 00360005
Reagent: NaOH
Batch ID: no Charge
Concentration [mol/l]: 1.00000
Determined at: 04/29/13 20:26:19
Expire date: 01/01/13
Opened/compound: 02/01/12
Test according ISO 8655: 01/01/00
Last modification: 04/29/13 13:26:21

Device information
Device: TitroLine 7750
Serial number: 100136502
Software version: 1316
The acidity can also calculate as % lactic acid instead of acid degree. In this case the calculation is:

\[
\% \text{ lactic acid} : \frac{(EP1-B) \cdot M \cdot T \cdot F1}{W \cdot F2}
\]

EP1: ml consumption to pH endpoint
B: blank value in ml. Here = 0
M: molecular weight of lactic acid: 90.08
T: exact concentration of the NaOH in mol/l (e.g. 0.2510 mol/l
F1: 0.1 (conversion factor to %)
W: sample amount in g
F2: 1

If you have any questions on the application, you can feel free to contact us.