

Application

**Determination of Acid
number and free fatty acids
(FFA) in fats and oils**

Application

Use

The method is suitable for edible fats and oils such as butter, olive, palm or sunflower oil. The acid number is the quantity of base, expressed in milligrams of potassium hydroxide, that is required to neutralize all acidic constituents present in 1 g of sample. The calculation of the % FFA depends on the titrated type of sample.

Appliances

- Titrator: TL 7000/TL 7750 M1
- Basic device
- Magnetic stirrer TM 235
- 10 mL Exchange unit WA 10, with amber glass bottle for the titrant, complete

Electrodes

- Electrode: N 6480 eth
- Electrolyte: L 5034 (LiCl/ethanol)
- Calibration: n.a.

Application

Reagents

- Titrant: KOH 0.1 mol/l in IPA (2-propanol). Also KOH 0.1 mol/l in ethanol
- Titer determination: Potassium hydrogen phthalate
- Solvent: Ethanol/diethyl ether (1:1)

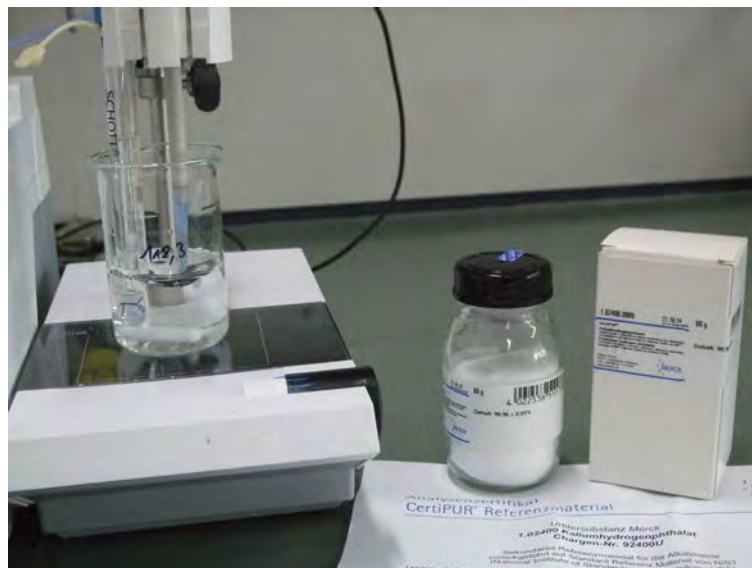
Description

Determination of the exact concentration of the KOH titrant

We recommend ready to use KOH titrants. The exact concentration of the KOH 0.1 mol/l can be determined using the titrimetric standard potassium hydrogen phthalate.

In a 150 mL beaker, 0.2 g of the standard are weighed accurately and dissolved in 80 mL of dist. water with stirring. It is titrated with the 0.1 mol/l KOH solution.

Repeat the standardization two times. The average value is stored automatically in the exchangeable unit.



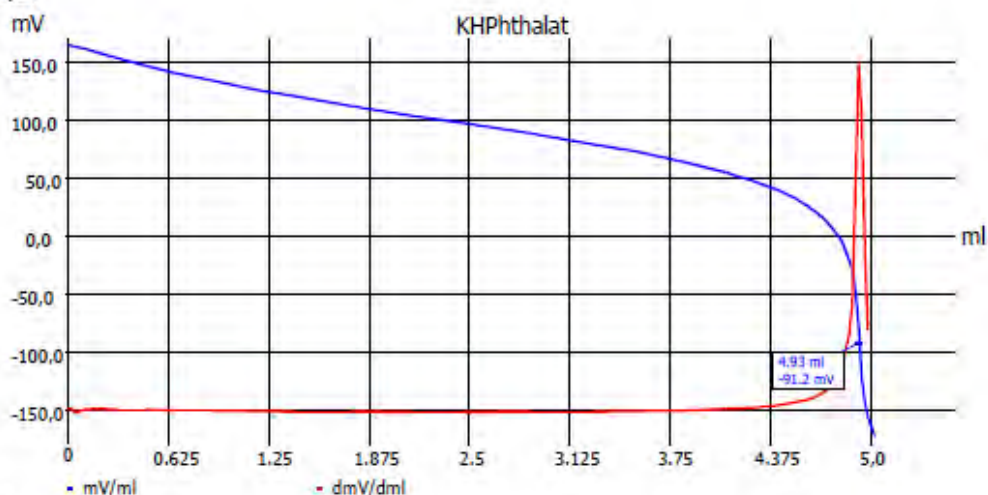
Pic. left: titer

Application

Page 1: Curve and result: Titer determination

GLP documentation

Titration graph



Method data

| | | | |
|--------------|-----------|---------------------|----------|
| Method name: | Titer KOH | Titration duration: | 3 m 25 s |
| End date: | 21.09.12 | End time: | 15:20:01 |

Titration data

| | | | |
|------------|-----------|---------|-----------|
| Sample ID: | KHPthalat | Weight: | 0.1040 g |
| Start mV: | 165.1 mV | End mV: | -171.7 mV |

| | | | |
|-----|---------------------|--------|--------------|
| EQ: | 4.933 ml / -91.2 mV | Titer: | 0.1032 mol/l |
|-----|---------------------|--------|--------------|

Calculation formula

| | |
|----------|--|
| Titer: | $(W \cdot F2) / ((EQ1 - B) \cdot M \cdot F1) \rightarrow M103$ |
| Mol (M): | 204.22000 |

| | | | |
|------------------|-----------|----------------|-----------|
| Weight (W): | man | Factor 2 (F2): | 1000.0000 |
| Blank value (B): | 0.0000 ml | Factor 1 (F1): | 1.0000 |
| Statistics: | Off | | |

Application

Page 2: Method parameters Titer determination:

Method data overall view

| | | | |
|-----------------|---------------------|--------------------|-------------------|
| Method name: | Titer KOH | Created at: | 09/19/12 17:05:06 |
| Method type: | Automatic titration | Last modification: | 09/19/12 17:32:02 |
| Measured value: | mV | Damping settings: | None |
| Titration mode: | Dynamic | Documentation: | GLP |

Dynamic: Steep

| | | | |
|--------------------------|---------|-----------------------|-----------|
| 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: Decrease
 Pretitration: Off
 End value: Off
 EQ: On (1)
 Slope value: Steep

Value: 700

Dosing parameter

| | | | |
|------------------------|----------|----------------|------|
| Dosing speed: | 100 % | Filling speed: | 30 s |
| Maximum dosing volume: | 50.00 ml | | |

Unit values

Unit size: 10ml
 Unit ID: 00072696
 Reagent: TBA Hydroxid
 Batch ID: 1.0265
 Concentration [mol/l]: 0.10320
 Determined at: 09/20/12 0:57:27
 Expire date: 04/12/12
 Opened/compounded: 10/19/11
 Test according ISO 8655: 12/01/10
 Last modification: 09/21/12 15:13:56

Application

Titration of the sample

Weigh the sample in a 100 ml beaker and add at least 50 ml of the solvent mixture to the sample. If necessary heat the solution to dissolve the sample.

The sample weight should be calculated and selected that the titration amount is not more than 5 ml because of the long titration time.

For acid numbers between 0.2 and 1 the sample amount should be about 10 – 20 g.

For acid numbers between 1 and 10 the sample amount should be about 1 – 3 g.

Place the beaker on the magnetic stirrer and start the titration method. After the titration rinse the electrode and burette tip with solvent. For each set of samples perform a blank titration with 50 ml of the titration solvent.

Result calculation

The enclosed titration example shows the calculation of the result in mg KOH /g sample (acid number).

The calculation of the % FFA value depends on the titrated sample. For many oil and fat samples the molecular weight of the oleic acid (282 g/mol) is used.

$$\% \text{ FFA} = (\text{EQ1}-\text{B}) * 282 * \text{T} * 100 / (1000 * \text{W})$$

EQ1: ml consumption at the equivalence point

B: ml consumption for the blank titration

282: molecular weight of oleic acid in g/mol

T: concentration of the KOH titrant (e.g.0.1 mol/l)

100: per 100 g sample

1000: conversion

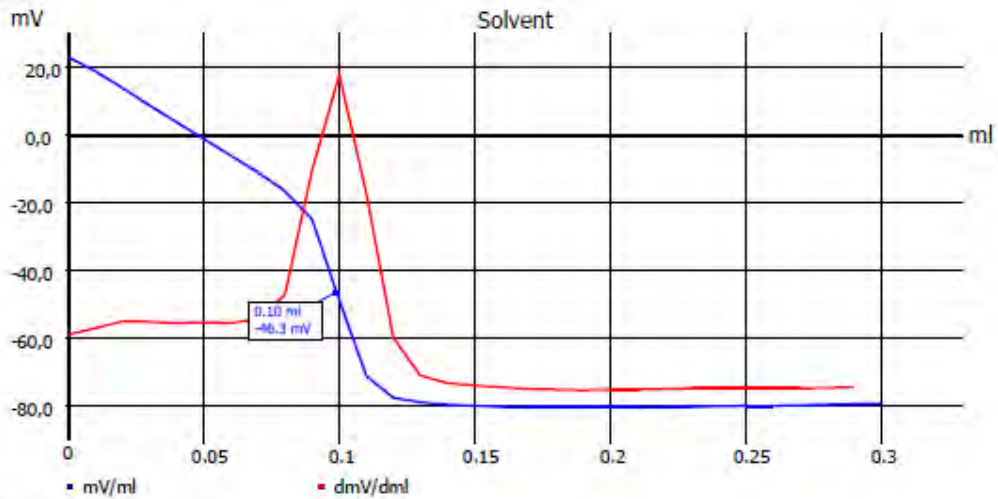
W: sample weight in g

Application

Blank titration page 1: Curve and result

GLP documentation

Titration graph



Method data

| | | | |
|--------------|----------|---------------------|----------|
| Method name: | Blank AN | Titration duration: | 6 m 14 s |
| End date: | 30.04.13 | End time: | 11:44:44 |

Titration data

| | | | |
|------------|---------------------|---------|----------|
| Sample ID: | Solvent | End mV: | -79.3 mV |
| Start mV: | 23.2 mV | | |
| EQ: | 0.099 ml / -46.3 mV | Blank: | 0.099 ml |

Calculation formula

Blank: EQ1 -> M02

Statistics: Off

Statistics: Off

Application

Blank titration page 2: method

Method data overall view

| | | | |
|-----------------|---------------------|--------------------|-------------------|
| Method name: | Blank AN | Created at: | 04/29/13 16:44:04 |
| Method type: | Automatic titration | Last modification: | 04/29/13 16:46:25 |
| Measured value: | mV | Damping settings: | strong |
| Titration mode: | Linear | Documentation: | GLP |
| Linear steps: | 0.010 ml | | |

Measuring speed / drift: 12 s

Initial waiting time: 10 s
 Titration direction: Decrease
 Pretitration: Off
 End value: Off
 EQ: Off

Dosing parameter

| | | | |
|------------------------|----------|----------------|------|
| Dosing speed: | 100.00 % | Filling speed: | 30 s |
| Maximum dosing volume: | 0.30 ml | | |

Unit values

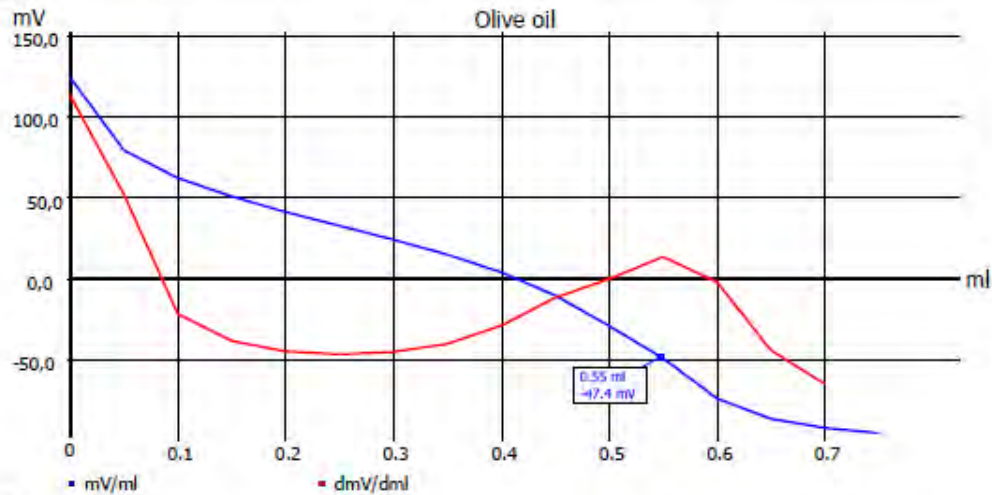
Unit size: 10ml
 Unit ID: 00072696
 Reagent: TBA Hydroxid
 Batch ID: 1.0265
 Concentration [mol/l]: 0.10350
 Determined at: 09/21/12 22:27:50
 Expire date: 04/12/12
 Opened/compounded: 10/19/11
 Test according ISO 8655: 12/01/10
 Last modification: 09/21/12 15:28:02

Application

Sample titration page 1: Curve and result

GLP documentation

Titration graph



Method data

| | | | |
|--------------|-------------|---------------------|----------|
| Method name: | Acid number | Titration duration: | 3 m 33 s |
| End date: | 30.04.13 | End time: | 12:19:19 |

Titration data

| | | | |
|------------|---------------------|--------------|------------|
| Sample ID: | Olive oil | Weight: | 10.03650 g |
| Start mV: | 123.5 mV | End mV: | -94.6 mV |
| EQ: | 0.548 ml / -47.4 mV | AN mg KOH/g: | 0.260 |

Calculation formula

| | | | |
|------------------|---|-------------|----------------|
| AN mg KOH/g: | $(EQ1-B) \cdot T \cdot M \cdot F1 / (W \cdot F2)$ | Mol (M): | 56.10000 |
| Blank value (B): | 0.0990 ml (M02) | Titre (T): | 0.10350000 (a) |
| Factor 1 (F1): | 1.0000 | Weight (W): | 10.03650 g (m) |
| Factor 2 (F2): | 1.0000 | Statistics: | Off |

Application

Sample titration page 2: method

Method data overall view

| | | | |
|-----------------|---------------------|--------------------|-------------------|
| Method name: | Acid number | Created at: | 04/29/13 16:20:59 |
| Method type: | Automatic titration | Last modification: | 04/29/13 16:46:51 |
| Measured value: | mV | Damping settings: | strong |
| Titration mode: | Linear | Documentation: | GLP |
| Linear steps: | 0.050 ml | | |

| | | | |
|--------------------------|---------------|-----------------------|-----------|
| Measuring speed / drift: | User-defined: | minimum holding time: | 07 s |
| | | maximum holding time: | 20 s |
| | | Measuring time: | 04 s |
| | | Drift: | 10 mV/min |

| | | | |
|-----------------------|----------|--------|-----|
| Initial waiting time: | 10 s | | |
| Titration direction: | Decrease | | |
| Pretitration: | Off | | |
| End value: | Off | | |
| EQ: | On (1) | | |
| Slope value: | Flat | Value: | 120 |

Dosing parameter

| | | | |
|------------------------|----------|----------------|------|
| Dosing speed: | 100.00 % | Filling speed: | 30 s |
| Maximum dosing volume: | 6.00 ml | | |

Unit values

| | |
|--------------------------|-------------------|
| Unit size: | 10ml |
| Unit ID: | 00072696 |
| Reagent: | TBA Hydroxid |
| Batch ID: | 1.0265 |
| Concentration [mol/l]: | 0.10350 |
| Determined at: | 09/21/12 22:27:50 |
| Expire date: | 04/12/12 |
| Opened/compounded: | 10/19/11 |
| Test according ISO 8655: | 12/01/10 |
| Last modification: | 09/21/12 15:28:02 |

Application

Notes

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

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