HIRANUMA APPLICATION DATA	Automatic Titrator	Data No.	A9	Apr. 19, 2018
FOOD	**Saponification value of cooking oil**			

1. Abstract

When potassium hydroxide ethanolic solution is added to fats and oils and heated, glyceride produces fatty acid potassium salt and glycerin by saponification (Formula (1)), and free fatty acid produces fatty acid potassium salt and water (Formula (2)).

$$RCOOR' + KOH \rightarrow RCOOK + R'OH \quad \cdots (1)$$

$$RCOOH + KOH \rightarrow RCOOK + H_2O \quad \cdots (2)$$

Saponification value is defined as "amount (mg) of potassium hydroxide required to react with heating in 1 g of fats and oils sample". This method is described in a variety of official standards such as "*Japan Agricultural Standards*" and *Pharmacopoeias*. Example of titration for saponification value in cooking oil is introduced here.

Reference

1) Japanese Pharmacopoeia Seventeenth Edition

2. Configuration of instruments and Reagents

(1) Instruments

Main unit	:	Hiranuma Automatic Titrator	COM series
Electrode	:	Glass reference combination electrode	GR-522BZ, Connect to IE-1.
Components	:	Buret tip (Tube Type), tubing accessories	

(2) Reagents

Titrant	:	0.5 mol/L Hydrochloric acid standard solution
Additive solution	:	0.5 mol/L Potassium hydroxide ethanolic standard solution

3. Measurement procedure

(1) Take 1.5 – 2.0 g* of sample into 200 ml Erlenmeyer flask and weigh it exactly.
(2) Add 25 ml of 0.5 mol/L potassium hydroxide ethanolic standard solution with volumetric pipet.
(3) Fit reflux condenser on the Erlenmeyer flask and heat to 80 °C for 30 minutes in water bath.
(4) Wash inside of reflux condenser with small amount of DI water and detach the condenser.
(5) Add 100 mL of DI water.
(6) Immerse the electrode and start titration with 0.5 mol/L hydrochloric acid standard solution.
(7) Blank measurement is also performed with procedure (2) – (6).
※ Sample size depend on expected value, and it's described in a standard method.

4. Measurement conditions and results

Examples of titration conditions

Measurement of blank

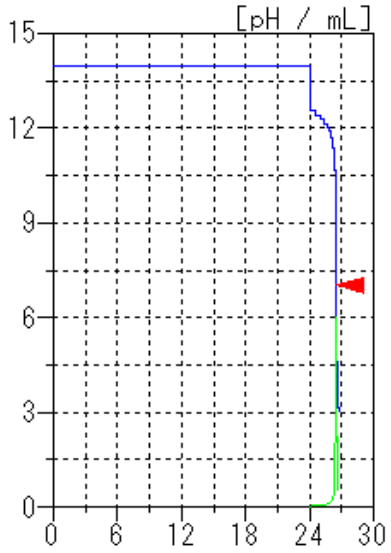
Condition No. 1								
Method	Auto		Constant No.	1		Mode No.	4	
Buret No.	1		Size	0	g	Pre Int	0	sec
Amp No.	1		Blank	0	mL	Del K	9	
D.Unit	pH		Molality	0	mol/L	Del Sens	0	mV
S-Timer	5	sec	Factor	0		Int time	3	sec
CP mL	24	mL	K	0		Int Sens	3	mV
T Timer	0	sec	L	0		Buret Speed	2	
D.P. mL	0	mL	Unit	mL		Pulse	40	
End Sens	1000		Formula	D			0.050	mL
Over mL	0.2	mL	Digits	3				
Max. Vol.	30	mL	Auto input Parameter		None			

Measurement of sample

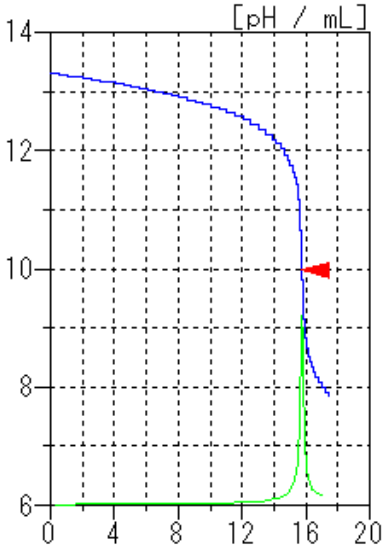
Condition No. 2								
Method	Auto		Constant No.	2		Mode No.	4	
Buret No.	1		Size	1.613	g	Pre Int	0	sec
Amp No.	1		Blank	26.44	mL	Del K	9	
D.Unit	pH		Molality	0.5	mol/L	Del Sens	0	mV
S-Timer	5	sec	Factor	1.004		Int time	3	sec
CP mL	0	mL	K	56.1		Int Sens	3	mV
T Timer	0	sec	L	0		Buret Speed	2	
D.P. mL	0.1	mL	Unit	mg/g		Pulse	40	
End Sens	500		Formula	(B-D)*K*F*M/S			0.050	mL
Over mL	0.2	mL	Digits	4				
Max. Vol.	30	mL	Auto input Parameter		None			

Measurement results

Sample	Measurement No.	Size (g)	Titrant volume (mL)	Saponification value (mg/g)	Statistical result		
BLANK	1	-	26.407	-	Avg.	26.44	mL
	2	-	26.457	-	SD	0.029	mL
	3	-	26.457	-	RSD	0.109	%
SAMPLE	1	1.613	15.732	186.956	Avg.	186.9	mg/g
	2	1.650	15.449	187.594	SD	0.738	mg/g
	3	1.514	16.434	186.123	RSD	0.395	%



Measurement of blank



Measurement of sample

Examples of measurement curves

5. Note

(1) Tips of measurement.

Note the sample loss during reflux condensation for pretreatment. In order to prevent loss due to volatile matter, the condenser needs to be cooled adequately. After pretreatment, add DI water immediately and start titration.

Keywords：Cooking oil, Saponification value, Pharmacopoeia

* Some measurement would not be possible depending on optional configuration of system.