Application Note

Determination of the total acid number in petroleum products

Industry	Petrochemicals
Instrument	Automatic potentiometric titrator
Measurement method	Potentiometric titration / Neutralization titration
Standards	ASTM D664

1. Scope

Determining the total acid number of petroleum products is important in evaluating their quality, as it indicates factors such as their degree of degradation. This Application Note introduces an example of the determination of the total acid number of petroleum products in accordance with ASTM D664. Mineral oil was used as the analyte, as it is a standard material of known total acid value.

2. Precautions

1) After each titration, make sure to immerse the electrode in an aqueous solution of hydrochloric acid solution (pH4.5~5.5) for 5 minutes in order to restore and maintain its proper working sensitivity.
2) Potassium hydroxide 2-propanol solution should be standardized at intervals where the change in concentration does not exceed 0.0005 mol/L.
3) To reduce the effect of carbon dioxide in the air, stirring with a stirrer should be controlled at a rotational speed that does not create a vortex on the liquid surface.
4) If the measurement results are not repeatable or the titration curve is unclear, it is possibly due to the influence of carbon dioxide in the air. To avoid this effect, it is recommended to blow nitrogen gas on the surface of the sample solution.

3. Post-measurement procedure

After the measurement is completed, the sensitivity of the glass electrodes may have decreased, so perform the sensitivity recovery operation described in "2. Precautions 1)".
Seal the refill port for internal liquid of the reference electrode with a rubber plug so that the internal liquid is prevented from leaking out or concentrating. Once done, store the electrode in accordance with the following:

- For short-term storage (less than one month) store immersed in pure water.
- For long-term storage (longer than one month) store immersed in a solution of pH 4 standard solution and 3.3 mol/L KCl solution mixed in an equal volume ratio.

4. Apparatus

Equipment	Automatic potentiometric titrator (preamplifier STD)
Electrode	Nonaqueous titration combined glass electrode (Electrode liquid 1 mol/L Lithium chloride in ethanol).

5. Reagents

Titrant	0.1 mol/L Potassium hydroxide in 2-propanol
Solvent	A solution of 500 mL of toluene, 5 mL of water, and 495 mL of 2-propanol

6. Procedure

-Measurement-

1) In accordance with its acid number, a specified quantity of sample (outlined in ASTM D644) is introduced into a beaker and the mass is measured.
2) Add 60 mL of titration solvent and titrate with 0.1 mol/L potassium hydroxide in 2-propanol solution.
3) A separate blank test is performed to correct the titration volume during sample measurement.

7. Calculation

Acid number (mgKOH / g) = (EP1 – BL1) × TF × C1 × K1 / S

EP1	Titration amount of sample (mL)	
BL1	Blank test (mL)	= 0.0606
TF	Factor of titrant	= 1.0837
C1	Concentration conversion coefficient	= 5.61 mg/mL
K1	Unit conversion factor	= 1
S	Quantity of sample (g)	

8. Example (Measurement or Parameter setting)

—Titration parameter—

<Titr. Mode>	Auto Int.
<Titr. Form>	EP Stop

<Titr. Para.>

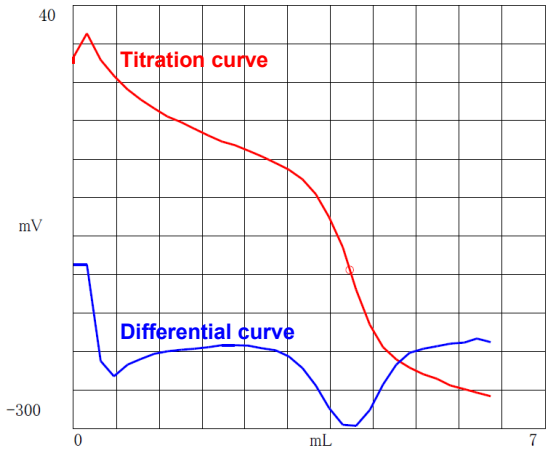
Burette No.	1
Max. Volume	10 (mL)
Channel/Unit(Ctrl.)	Ch1, mV
Channel/Unit(ref.)	off
pH Polarity	Standard
Type of Titration	Not check
EP Direction	Negative
Wait Time	10 (s)
Dose Mode	Non

<Ctrl. Para.>

Number of EP	1
End Sense	Set
EP Sense (Potential)	20 (dE)
EP Sense (Differential)	100 (dE/dmL)
Gain	1
Data Sampling	Auto
Ctrl. Speed Mode	set
Cut Off Time	3 (s)
Unit Volume	0.2 (mL)
Dispense Speed	1 (s/mL)
Other Control	Standard
Stirrer Speed	2

(Listed above are example settings. Availability of settings may vary by instrument model.)

—Titration curve—



— Measurement results —

Table. Measurement results

	Sample (g)	Titration amount (mL)	Acid number (mgKOH/g)
1	5.0228	4.0973	4.89
2	5.0191	4.1074	4.90
3	5.0065	4.0809	4.88
Mean			4.89
SD			0.01
RSD(%)			0.21

9. Notes

In this standard, the endpoint is defined as the point of inflection of the titration curve. If an inflection point cannot be obtained, the endpoint is defined as the point at which the potential of the non-aqueous buffer solution reaches the potential specified in the standard. Please contact us if you have any questions.

10. Reference

ASTM D664 Standard Test Methods for Acid Number of Petroleum Products by Potentiometric Titration.