

Application Note

Determination of the total base number in petroleum products (Perchloric acid method)

Industry	Petroleum
Instrument	Automatic potentiometric titrator
Measurement method	Potentiometric titration / Neutralization titration
Standards	ASTM D2896

1. Scope

The total base number of a petroleum product is an important indicator in evaluating the quality of the product. This Application Note introduces an example of the determination of the total base number of petroleum products in accordance with ASTM D2896 Procedure B. The measurement sample was a standard with a known total base number.

2. Precautions

- 1) For repeated measurements, an operation to restore the sensitivity of the electrode is required for each measurement. After measurement, wash the electrodes with titration solvent and then immerse them in pure water until the indicated potential becomes stable. Wash the electrode again with the titration solvent before the next measurement.
- 2) The electrode should not be left immersed in the titration solvent.
- 3) If the glass electrode becomes contaminated, clean it by immersing it in cold chromic acid or its substitute for 5 minutes.
- 4) 0.1 mol/L perchloroacetic acid solution should be standardized at least once a week.
- 5) The organic solvent should be kept within 5 °C of the difference between the temperature at the time of standardization and the temperature at the time of use.
- 6) Handle the reagents in a well ventilated room or a draft chamber.

3. Post-measurement procedure

After all, measurements are completed, the sensitivity of the electrode becomes deteriorated. Therefore, the operations described in "2. Precautions, 1)" should always be performed.

4. Apparatus

Main unit	Automatic potentiometric titrator (preamplifier : STD)
Electrode	Combined glass electrode for nonaqueous titration (Electrode liquid Saturated NaClO ₄ acetic acid solution)

5. Reagents

Reagent	0.1mol/L perchloric acid acetic acid solution
Titration solvent	Glacial acetic acid : Chlorobenzene = 1 : 2

6. Procedure

-Blank test-

- 1) Add 60 mL of the titration solvent into a 200 mL tall beaker.
- 2) Titrate with 0.1mol/L perchloric acid acetic acid solution to measure blank level.
- 3) After measurement, the electrode is cleaned with titration solvent and immersed in pure water for 5 minutes.

-Measurement-

- 1) Collect 3 g or 10 g of the sample in a 200 mL tall beaker, depending on the estimated base value.
- 2) Add 60 mL of the titration solvent.
- 3) Titrate with 0.1 mol/L perchloric acid acetic acid solution.
- 4) After measurement, the electrode is cleaned with titration solvent and immersed in pure water for 5 minutes.

7. Calculation

$$\text{Total base number (mgKOH/g)} = (\text{EP1} - \text{BL1}) \times \text{TF} \times \text{C1} \times \text{K1} / \text{S}$$

EP1	Titration amount of sample (mL)
BL1	Blank level (mL) = 0.0063
TF	Factor of titrant = 0.9604
C1	Concentration conversion coefficient = 5.61 mg/mL
K1	Unit conversion coefficient = 1
S	Sample (g)

8. Example

-Titration parameter-

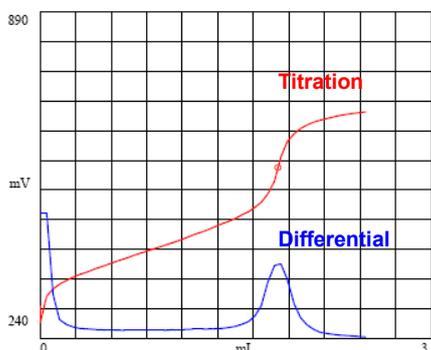
<u><Titr. Mode></u>	Auto Int.	<u><Ctrl. Para.></u>	
<u><Titr. Form></u>	EP Stop	Number of EP	1
		End Sense	Auto
		Gain	1
<u><Titr. Para.></u>		Data Sampling	Auto
Max. Volume	0.2 (mL) (Blank test)	Ctrl. Speed	Standard
	20 (mL) (Sample)	Other Ctrl.	Standard
Channel/Unit(Ctrl.)	Ch1, mV	Auto Int. Mode	Blank (Blank test)
Channel/Unit(Ref.)	Off		Standard (Sample)
pH Polarity	Standard	Stirrer Speed	4
Titration Type Check	No Check		
Direction	Auto		
Wait Time	0 (s)		
Dose Mode	None		

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

-Measurement results-

- Total base number Label Value 3.03 mg KOH/g

- Titration curve -

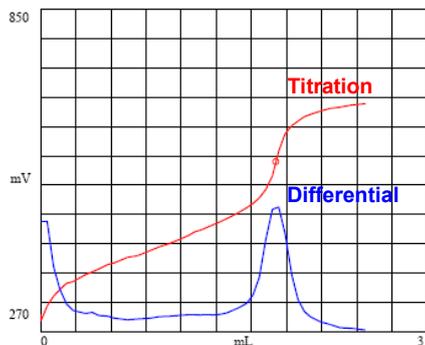


-Measurement results-

	Sample	Titration amount	Base number
	(g)	(mL)	(mgKOH/g)
1	3.3018	1.8257	3.04
2	3.3063	1.8279	3.02
3	3.3066	1.8300	3.02
Mean	-	-	3.03
SD	-	-	0.01
RSD(%)	-	-	0.3

- Total base number Label Value 1.00 mg KOH/g

- Titration curve -



-Measurement results-

	Sample	Titration amount	Base number
	(g)	(mL)	(mgKOH/g)
1	10.0001	1.8287	1.01
2	10.0087	1.8309	1.00
3	10.0022	1.8306	1.00
Mean	-	-	1.00
SD	-	-	0.01
RSD(%)	-	-	1.0

9. References

ASTM D2896 Standard Test Method for Base Number of Petroleum Products by Potentiometric Perchloric Acid Titration