

Sheet No.

GT200-PE027E Oil

Determination of base number in diesel engine oil (Hydrochloric acid titration, set potential) ——— 1/4

*This application sheet is provided as reference, and does not assure the measurement results. Please consider analysis environment, external factors and sample nature for optimal conditions before the measurement.

Outline

Base number on hydrochloric acid titration is determined with titration by hydrochloric acid in 2-propanol titrant after dissolving new or used oil in titration solvent contains toluene, 2-propanol, chloroform and small amount of water.

If the titration curve doesn't have clear inflection point, set the end point at the potential of pH3 buffer solution. Check the potential with immersing the electrode into the buffer solution.

Titration Type	: Non-aqueous Neutralization, Titration mode: SET-P, Detection: mV
◆Reference	: ASTM D4739-11 Standard Test Method for Base Number Determination by Potentiometric Hydrochloric Acid Titration

Apparatus

Automatic titrator	: GT-200
Electrodes	: Reference Electrode sleeve type, Glass electrode
Reference electrode solution	: 3mol/L, Lithium chloride in ethanol
Buret size	: 5ml

Reagents

[Titrant]

■0.1mol/L- hydrochloric acid in 2-propanol for testing neutralization number in oil

[Prepared reagents]

■Titration solvent : mixed 1L of toluene, 1L of 2-propanol, 1L of chloroform and 10ml of pure water

■3mol/L of Lithium chloride in ethanol : Dissolve 12.7g of lithium chloride, special grade reagent, into ethanol, special grade reagent, and dilute the solution to 100ml by the ethanol.

■pH3 Buffer solution

Analytical Procedure

[Blank measurement]

(1) Add 75ml of the titration solvent into a 100ml beaker by a measuring cylinder.

(2) Titrate with 0.1mol/L .hydrochloric acid in 2-propanol titrant

[Set end point]

Record end point (END1) on the potential (mV) immersing the electrodes into the pH3 buffer solution.

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[Sample measurement]

- (1) Add proper size of sample depends on the estimated base number into a 200ml beaker. Sample size is calculated by the formula mentioned in the method.
- (2) Add 75ml of the titration solvent into the above mentioned beaker by a measuring cylinder.
- (3) Titrate with 0.1mol/L . hydrochloric acid in 2-propanol titrant

[Calculation]

Base number (mgKOH/g) = (A1- BL) × M × E × f × FW / S × R
(Used prefixed formula on GT-200)

- A1 : Titration volume of 0.1mol/L- hydrochloric acid in 2-propanol titrant for sample measurement (ml)
 BL : Titration volume of 0.1mol/L- hydrochloric acid in 2-propanol titrant for Blank measurement (ml)
 M : Molarity of 0.1mol/L- hydrochloric acid in 2-propanol titrant (0.1)
 E : Equivalent number of 0.1mol/L- hydrochloric acid in 2-propanol titrant (1)
 f : Factor of 0.1mol/L- hydrochloric acid in 2-propanol titrant
 FW :Formula weight of potassium hydroxide (56.1)
 S : Sample size(g)
 R : Dilution rate (1)

Other Requirements

- Calibrate the apparatus by three standards, pH 7, 4 and 11 before measurement. Select “Sleeve type liquid: 3.3M KCL (GTRS10B)” and “Three point calibration (Input pH)” on the “pH Calibration” of GT-200.
- For using 5ml Buret, set the volume by “Setting” on the Automatic Buret’s software.
- After a measurement, wash the electrodes by the titration solvent and immerse them in pure water for 5min. as conditioning.
- Confirm reagent labels and safety data sheets for safety
- Wear protective equipment (eye protector, gloves and others.) when handling reagents.

Measurement Results

	Sample size(g)	Titrant (ml)	Results(mg KOH/g)
1	8.0044	1.3620	0.95
2	8.0051	1.3668	0.96
3	8.0072	1.3958	0.98

N 3
 Average 0.96
 SD 0.012
 RSD(%) 1.31

Base number in diesel engine oil (5W-30) is measured by GT-200.

Base number is measured with end point set by buffer solution’s potential because the titration curve doesn’t have clear inflection point.

Average of three measurements is around 0.96mgKOH / g.

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ID No. : 1 GT No.1

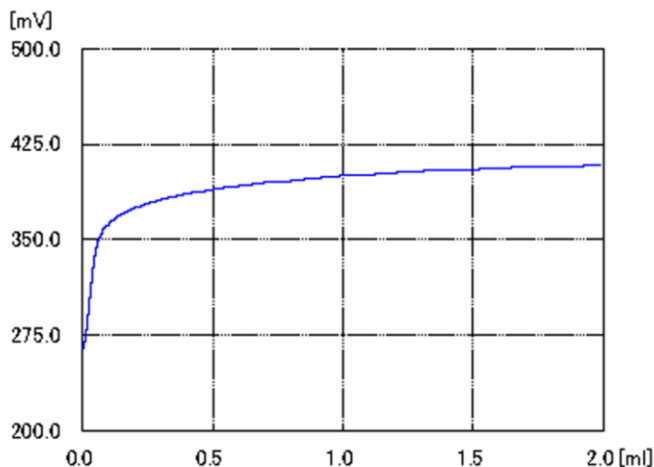
User : GT-200

Measurement : 2014/09/30 09:45

Sample Name : BLANK

Type : Sample Titr

Sample Size : 75 [ml]



P-initial : 264 [mV]

Start : 0 [ml] 264 [mV]

End : 1.99 [ml] 409 [mV]

Measuring Time : 40' 2"

File No. : 17
 Titr File No. : 41 Base Number / Blank
 Mode : SET-P End1 : 211.2[mV]
 Detect : mV1
 BRT No. : 1
 Reagent : 8
 WTint : 30 [sec]
 Vup : 10 [μl]
 Vlow : 10 [μl]
 dE : 200 [mV]
 dT : 12 [sec]
 Vmax : 10 [ml]
 Vover : 0.05 [ml]

C1 : A1

[ml]

Reag : 0.1M HCl/IPA

E : 1

M : 0.1 [Mol/l]

F : 1

Buret Injection Speed : 500 [ul/sec]

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ID No. : 2 GT No.1

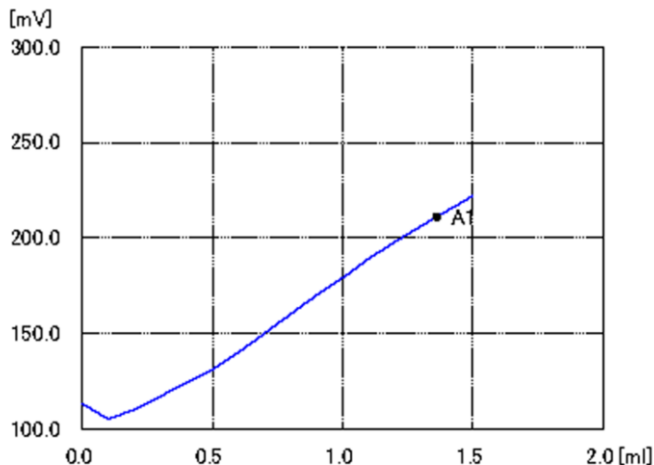
User : GT-200

Measurement : 2014/09/30 10:57

Sample Name : Engine Oil 2

Type : Sample Titr

Sample Size : 8.0044 [g]



C1 : 0.95 [mgKOH/g]

A1: 1.362 [ml] 211 [mV]

P-initial : 113 [mV]

Star0t : 0 [ml] 113 [mV]

End : 1.5 [ml] 222 [mV] Measuring Time : 22'45"

File No. : 15 OIL / Base Number

Titr File No. : 42 Base Number

Mode : SET-P End1 : 211.2 [mV]

Detect : mV1

BRT No. : 1

Reagent : 8

WTint : 60 [sec]

Vup : 100 [μl]

Vlow : 100 [μl]

dE : 200 [mV]

dT : 90 [sec]

Vmax : 50 [ml]

Vover : 0.05 [ml]

C1 : (A1-BL)*M*E*f*FW/S*R

[mgKOH/g]

Reag : 0.1M HCl/IPA

E : 1

M : 0.1 [Mol/l]

F : 1

BL : 0 [ml]

F : 56.1

R : 1

Buret Injection Speed : 125 [ul/sec]