Application Note

Alkalinity of AdBlue®

Industry	:	Chemicals
Instrument	:	Automatic potentiometric titrator
Measurement method	:	Potentiometric titration / Neutralization titration
Standards	:	ISO 22241, JIS K2247

1. Scope

Alkalinity of AdBlue® was determined based on “ISO 22241 Diesel engines - NOx reduction agent AUS 32 -. Alkalinity is expressed as a percentage by mass of ammonia.

A sample was diluted with pure water, and then potentiometrically titrated with 0.01 mol/L hydrochloric acid. The point at pH 5.70 was regarded as the endpoint. Alkalinity of the sample is calculated from the volume of hydrochloric acid consumed to titrate the sample to the endpoint.

2. Precautions

1) Handle reagents in a well ventilated room or a fume hood.
2) After a measurement, wash the electrode with pure water.
3) Calibrate the electrode with standard buffer solutions at pH 4.01 and pH 9.18 before measurement.

3. Post-measurement procedure

1) Wash the electrode with pure water and keep it immersed in water.

4. Apparatus

Main unit	:	Automatic potentiometric titrator (preamplifier : STD)
Electrode	:	Combined pH glass electrode (inner solution : 3.3 mol/L potassium chloride solution)

5. Reagents

- 0.01 mol/L hydrochloric acid
- Standard buffer solution at pH 4.01
- Standard buffer solution at pH 9.18

6. Procedure

-Measurement-
1) Add 10 g*[1] of sample into a 200 mL tall beaker and measure mass of it.
2) Add 100 mL of pure water.
3) Titrate with 0.01 mol/L hydrochloric acid to the endpoint at pH 5.70.

*1 Set the quantity of sample according to the alkalinity determined by preliminary test. In preliminary test, 1 g of sample diluted with 100 mL of pure water was titrated with 0.01 mol/L hydrochloric acid. A corresponding table between alkalinity found by preliminary test and quantity of sample for determination is shown below.

Alkalinity found by preliminary test (mass%)	0.02	0.05	0.1	0.2 - 0.5
Quantity of sample for determinaton (g)	10	5	2	1

7. Calculation

Alkalinity (mass%) = EP1 × TF × C1 × K1 / S

EP1	:	Titration amount (mL)
TF	:	Factor of titrant = 1.0165
C1	:	Concentration conversion coefficient = 0.17 mg/mL
K1	:	Unit conversion coefficient = 0.1
S	:	Quantity of sample (g)

8. Example

-Parameter-

<Titr. Mode> : Auto Int.
<Titr. Form> : Level Stop

<Titr. Para.>

Max Volume	: 40 (mL)
Channel/Unit(Ctrl.)	: Ch1, pH
Channel/Unit(Ref.)	: Off
pH Polarity	: Standard
Titr. Type Check	: No Check
Direction	: Auto
Wait Time	: 0 (s)
Dose Mode	: None

<Ctrl. Para.>

Number of EP	: 1
1st End Level	: 5.70 pH
Gain	: 1
Data Sampling	: Auto
Ctrl. Speed	: Standard
Other Control	: Standard
Auto Int. Mode	: Standard
Stirrer Speed	: 3

（This parameter is an example of our refractometer. For other models, parameter items may be different or other items may be added.）

-Measurement results-

Measurement results and titration curve are shown in Table 1 and Fig. 1 respectively.

Table 1 Measurement results

	Quantity of sample (g)	Titration amount (mL)	Alkalinity (mass%)
1	9.9885	3.9938	0.0069
2	10.0012	3.9463	0.0068
Mean	-	-	0.0069
Repeatability	-	-	0.0001

*Repeatability means the difference of the two results.

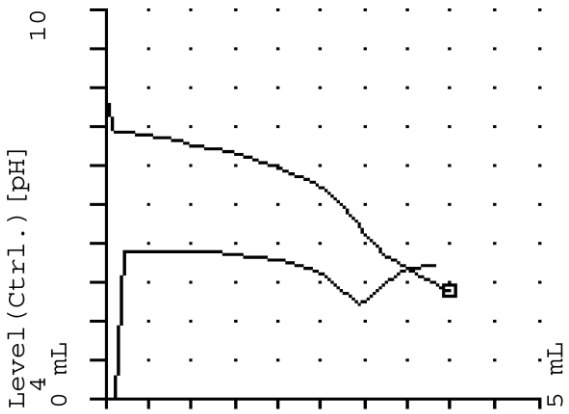

Fig. 1 Titration curve

9. Summary

As the measurement results of AdBlue® alkalinity, the repeatability was within the limit (0.01) specified by the ISO and JIS standards, and the results satisfied the quality requirement (within 0.2 mass%).

When actually measuring, please refer to the latest standards.

10. References

1) ISO 22241 : 2006 (E) Diesel engines－NOx reduction agent AUS 32－

2) JIS K2247 : 2009 Diesel engines－NOx reduction agent AUS 32－