| *HIRANUMA APPLICATION DATA* | Automatic Titrator | Data No. | L5 | Oct. 7. 2022 |
|---|---|---|---|---|
| **Lubricant petroleum products** | **Acid number in Refrigerating machine oil** | | | |

## 1. Abstract

Refrigerating machine oil is used in a state mixed with refrigerant such as hydrofluorocarbon. The official standard of refrigerant (e.g. JIS K 2211) specifies the acid number test according to JIS K 2501. It is indicated by "milligrams of potassium hydroxide required to neutralize acidic components contained in 1 g of the sample".

In this article, we apply the color-indicator titration method described in JIS K2501 to automatic titrator, and introduce measurement of acid number in refrigerating machine oil by photometric titration. Acid and base number with color-indicator titration is also regulated in ASTM D974. *p*-Naphtholbenzein is used as color indicator.

## 2. Configuration of instruments and reagents

(1) Configuration of instruments

Main unit : Hiranuma automatic titrator COM Series with photometric unit M type

Electrode : Interference filter 650 nm

(2) Reagents

Titrant : 0.1 mol/L potassium hydroxide in 2-propanol

Titration solvent : Mixture of 500 mL of Toluene, 495 mL of 2-propanol and 5 mL of water

Indicator : 1 g of *p*-naphtholbenzein dissolved in 100 mL of titlation solvent

## 3. Measurement procedure

(1) Take 20 g of sample into 200 mL tall beaker and weigh accurately to 0.1 mg digits.
Note that the weight of sample will be changed depending on the acid number.

(2) Add 100 mL of titration solvent and dissolve sample by stirrer.
The stirrer speed must be adjusted to avoid the scattering of contents or taking the air into the solution.

(3) Immerse the electrodes and titrate by alcoholic KOH titrant. Also, perform the blank test with the same procedure of sample measurement.

## 4. Measurement conditions and results

### Examples of titration conditions

Measurement of blank

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cndt No. | 37 | | | | | | | |
| Method | B-Cross | | ConstantNo. | 37 | | Mode No. | 41 | |
| Buret No. | 1 | | Size | 0 | g | Int Time Max | 60 | sec |
| Amp No. | 2 | | Blank | 0 | mL | Del K | 0 | |
| D. Unit | T% | | Molarity | 0.1 | mol/L | Del Sens | 0 | mV |
| S-Timer | 60 | sec | Factor | 0.9775 | | Int Time | 10 | sec |
| C.P. mL | 0 | mL | K | 56.1 | | Int Sens | 20 | mV |
| T Timer | 0 | sec | L | 0 | | Brt Speed | 2 | |
| D.P. mL | 0 | mL | | | | Pulse | 8 | |
| End Sens | 1000 | | Unit | mL | | | | |
| Over mL | 0.3 | mL | Formula | D | | | | |
| Max.Vol. | 1 | mL | Digits | 4 | | | | |
| | | | Auto In Pram. | Non | | | | |

Measurement of sample

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cndt No. | 38 | | | | | | | |
| Method | B-Cross | | ConstantNo. | 38 | | Mode No. | 42 | |
| Buret No. | 1 | | Size | 20.059 | g | Int Time Max | 60 | sec |
| Amp No. | 2 | | Blank | 0.123 | mL | Del K | 0 | |
| D. Unit | T% | | Molarity | 0.1 | mol/L | Del Sens | 0 | mV |
| S-Timer | 60 | sec | Factor | 0.9775 | | Int Time | 10 | sec |
| C.P. mL | 0 | mL | K | 56.1 | | Int Sens | 20 | mV |
| T Timer | 0 | sec | L | 0 | | Brt Speed | 2 | |
| D.P. mL | 0 | mL | | | | Pulse | 20 | |
| End Sens | 1000 | | Unit | mg/g | | | | |
| Over mL | 0.5 | mL | Formula | (D-B)*K*F*M/S | | | | |
| Max.Vol. | 20 | mL | Digits | 4 | | | | |
| | | | Auto In Pram. | Non | | | | |

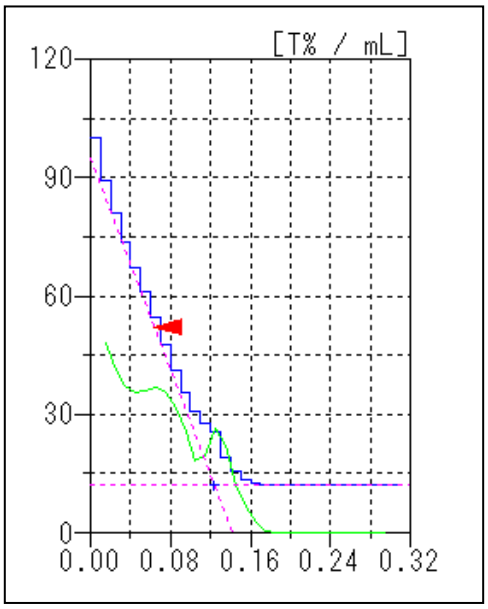
### Measurement results

Measurement of blank

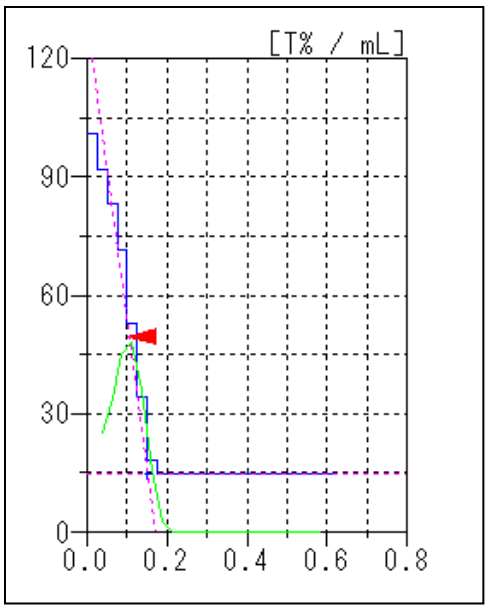
| Measurement number | Size (g) | Titer (mL) |
|---|---|---|
| 1 | — | 0.123 |
| 2 | — | 0.122 |
| | Average | 0.123 |

Measurement of sample

| Measurement number | Size (g) | Titer (mL) | Base number (mgKOH/g) |
|---|---|---|---|
| 1 | 20.0590 | 0.151 | 0.0077 |
| 2 | 20.0084 | 0.157 | 0.0093 |
| | | Average | 0.0085 mgKOH/g |




Measurement of blank




Measurement of sample

Examples of titration curves

## 5. Note

(1) Management of the photometric probe

As the probe is used, it becomes dirty on light path and the transmittance decreases. Therefore it is necessary to wipeout adherents with soft cloth on regular bases.

(2) Maintenance of buret

It is recommended to wash the flow channel of buret with water. This is because alcoholic KOH titrant have a tendency toward crystallization. When not using for a long time, please discharge titrant and then wash flow channel with water.

(3) End point detection

When the endpoint is not detected sharply, it may be due to the absorption of carbon dioxide. In this case, purging nitrogen gas in the head space of the beaker improves end point detection.

Keyword：JIS K2211, JIS K2501, ASTM D974, Refrigerating machine oil, Refrigerant, Acid number, Color indicator titration, Photometric titration.