Application Note AN-T-240

Total acid number with conductometric titration

Determination of total acid number of petroleum products

The total acid number (TAN) measures the acidic components in a substance, typically in petroleum products like engine oils or lubricants. The TAN value indicates the quantity of acid in milligrams of potassium hydroxide (KOH) which is required to neutralize one gram of the sample.

The TAN value is an important parameter for assessing the acidity of oils and fuels. Regular monitoring of total acidity is essential for many reasons. It helps ensure proper performance and longevity of lubricants or petroleum products.

Fresh, unused oils have a low TAN value, but a high TBN (total base number) value. Over the service life of the oil, the TAN value increases while the TBN value (a measure of the alkaline reserve to neutralize acids) decreases.

The total acid number is an important parameter to monitor in petroleum products because excessive acidity can lead to corrosion and impairment of equipment. This Application Note describes the determination of TAN in sliding track oil with conductometric titration.

SAMPLE

Sliding track oil

EXPERIMENTAL

The sample was titrated with potassium hydroxide in 2-propanol solution until after the first equivalence point. The 5-ring conductivity measuring cell was used for this analysis.

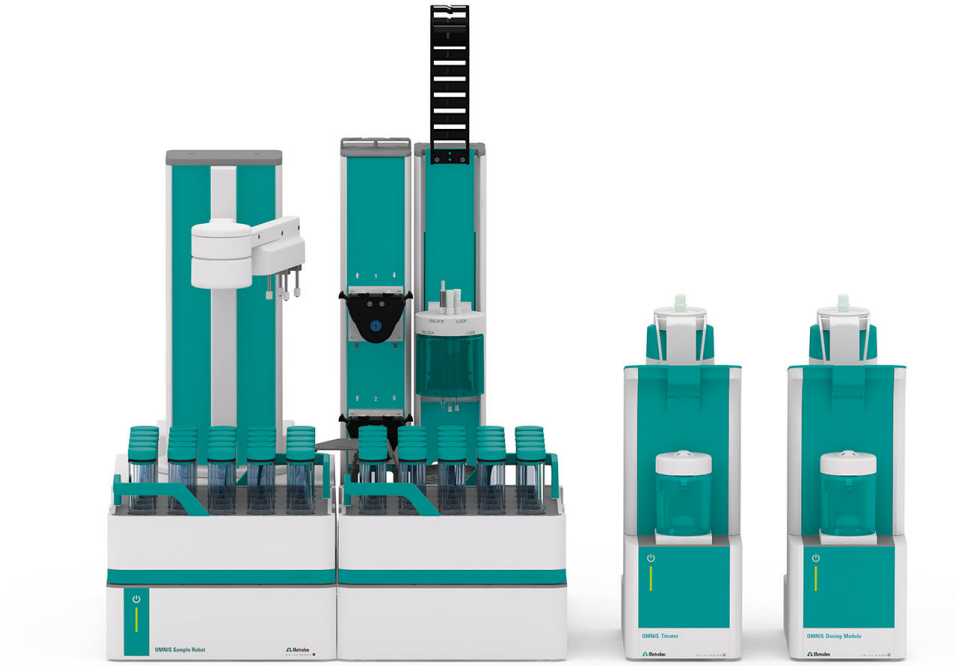

Figure 1. OMNIS Titrator with an OMNIS Dosing Module and OMNIS sample robot.

RESULTS

The determination of the TAN value (Table 1) gave accurate results. An example determination is shown in Figure 2.

Table 1. Results of the sliding track oil determination by conductometric titration.

Sample	Result TAN	RSD in %
Sample (n=3)	0.40 mg KOH/g	1.1

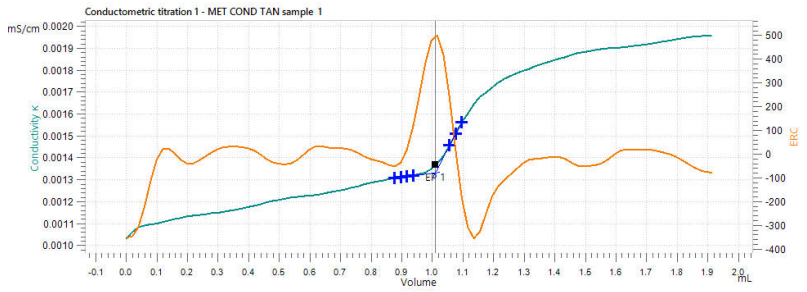

Figure 2. Example curve to determine the total acid number in sliding track oil.

CONCLUSION

This method does not require indicators or complicated instruments. Compared to other titration methods, it is extremely sensitive and delivers precise results. The measurement is easy to carry out. It can be used for a wide range of sample types, including solutions, suspensions, and slurries.

The robust design of the conductivity sensor allows for easy cleaning. In contrast to potentiometric sensors, it does not require any rehydration period between the measurements.

Conductivity titration can be used for highly diluted solutions, nonaqueous solutions, and titration of weak acids or bases. The endpoint of this titration method is sharp and precise compared to other titration methods.

CONTACT

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CONFIGURATION

OMNIS Titrator with magnetic stirrer, without function license

Innovative, modular potentiometric OMNIS Titrator for stand-alone operation or as the core of an OMNIS titration system. Thanks to 3S Liquid Adapter technology, handling chemicals is more secure than ever before. The titrator can be freely configured with measuring modules and cylinder units and can have a stirrer added as needed. Thanks to various software function licenses, various measuring modes and functionalities are possible.

- Control via PC or local network
- Connection option for up to four additional titration or dosing modules for additional applications or auxiliary solutions
- Connection option for one rod stirrer
- Various cylinder sizes available: 5, 10, 20 or 50 mL
- Liquid Adapter with 3S technology: Secure handling of chemicals, automatic transfer of the original reagent data of the manufacturer

Measuring modes and software options:

- Endpoint titration: "Basic" function license
- Endpoint and equivalence point titration (monotonic/dynamic): "Advanced" function license
- Endpoint and equivalence point titration (monotonic/dynamic) with parallel titration: "Professional" function license

OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

Function license Conductometric titrator

Function license "Conductometric titrator" for the OMNIS Titrator

Contains the function modes

- MET COND
- MEAS U/T/pH/COND
- Liquid Handling
- Titration only with internal buret of an OMNIS Titrator

Measuring module conductivity

Measurement channel for one OMNIS Titrator or Titration Module for the connection of conductivity measuring cells.

5-ring conductivity measuring cell c = 0.7 cm-1 with Pt1000 (fixed cable 0.65 m)

5-ring conductivity measuring cell with cell constant c = 0.7 cm^{-1} (guide value), with integrated Pt1000 temperature sensor and with fixed cable (0.65 m) for connecting to the OMNIS Measuring Module Conductivity.

This sensor is suitable for measurements of medium conductivities, e.g., in:

- Drinking water
- Surface water
- Waste water