Application Note AN-H-141

Acid number in crude oil and gas oil according to ASTM D8045

Fast and reliable analysis of various oil products used in the petrochemical industry by thermometric titration

Accurate knowledge of the total acid number in crude oil is important for the determination of its price. Additionally, by monitoring the acidity of crude oil and the associated process oils, unexpected shutdowns can be prevented, and thus costly treatment chemicals preserved.

Thermometric titration is a reliable method for the analysis of the total acid number (TAN) in assorted petroleum products. During thermometric titration (TET), the enthalpy change of the reaction is monitored rather than the potential. The titration endpoint is revealed by an inflection in the temperature curve.

In this Application Note, the acid number of multiple oil products is determined with titration as per ASTM D8045 by using catalytic thermometric titration. Compared to potentiometric titration, TET is faster and more convenient.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on miscellaneous crude oil products.

Usually, sample preparation is not required. However, some samples may require slight warming or dissolution in xylene prior to titration. It is possible to titrate warm samples (<60 °C) without a loss of resolution or precision.

EXPERIMENTAL

The determinations are carried out on an OMNIS Professional Titrator equipped with a dThermoprobe (**Figure 1**). To avoid manually handling chemicals, all solutions can be automatically added using an OMNIS Dosing Module.

An appropriate amount of sample is weighed into the titration vessel, and solvent as well as paraformaldehyde are added. Afterwards, the solution is titrated until after the first exothermic endpoint with standardized potassium hydroxide (**Figure 2**).

Figure 1. OMNIS Titrator Professional equipped with a dThermoprobe and a rod stirrer.

RESULTS

This method offers very accurate results for TAN as displayed in Table 1.

Table 1. Results for the total acid number determination according to ASTM D8045 on an OMNIS system equipped for the thermometric titration.

TAN (n = 6)	Mean in mg KOH/g sample	SD(rel) in %
Cutting oil	0.96	0.2
Desalted Crude	0.76	2.1
Raw Crude	0.73	1.1
Vac. Light Gas	1.23	0.0
Vac. Heavy Gas	1.25	0.8
Atm. Heavy Gas	1.15	1.2
650 Endpoint Gas	0.73	1.1

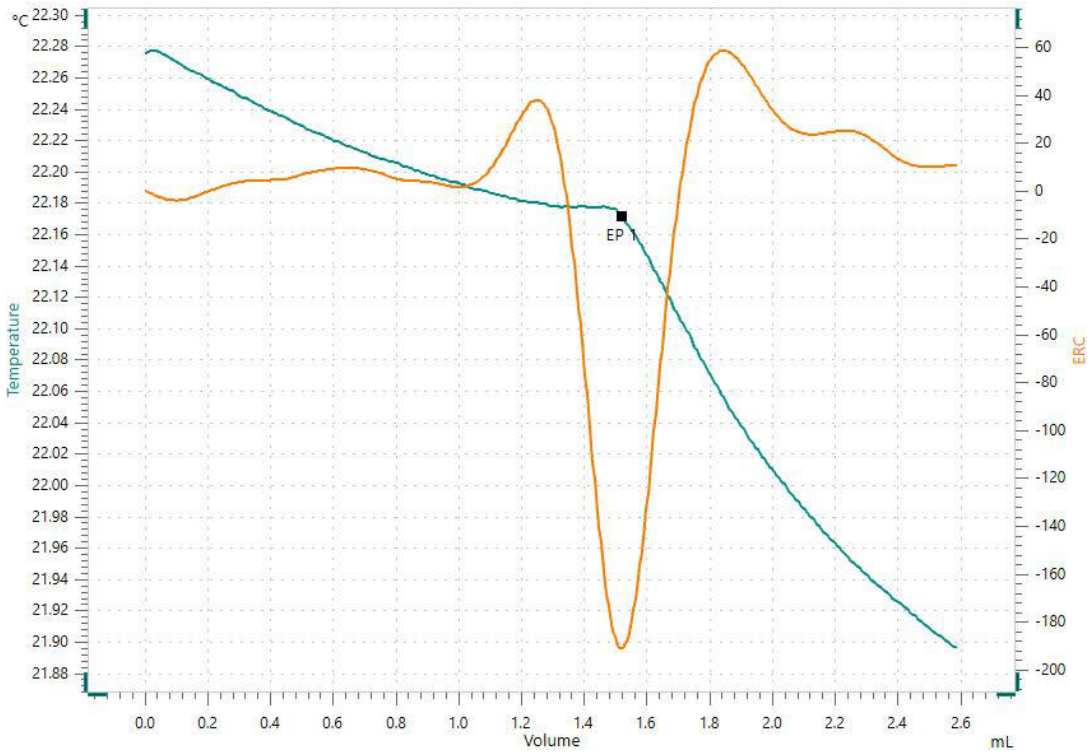

Figure 2. Titration curve of the thermometric determination of a raw crude oil sample.

Thermometric titration is a very fast and accurate method that can determine the TAN of various crude oil products in one easy titration. No sensor maintenance is required, making TET a robust alternative to other color indicator titration test methods.

CONTACT

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CONFIGURATION

OMNIS Professional Titrator without stirrer

Innovative, modular potentiometric OMNIS Titrator for endpoint titration and equivalence point titration (monotonic/dynamic). Thanks to 3S Liquid Adapter technology, handling chemicals is safer than ever before. The titrator can be freely configured with measuring modules and cylinder units and can have a stirrer added as needed. Including "Professional" function license for parallel titration with additional titration or dosing modules.

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

Stirring propeller 30 mm ETFE

Stirring propeller 30 mm ETFE with adjustable height for use with Rod Stirrer "Titrator" or Rod Stirrer "Sample Robot"