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

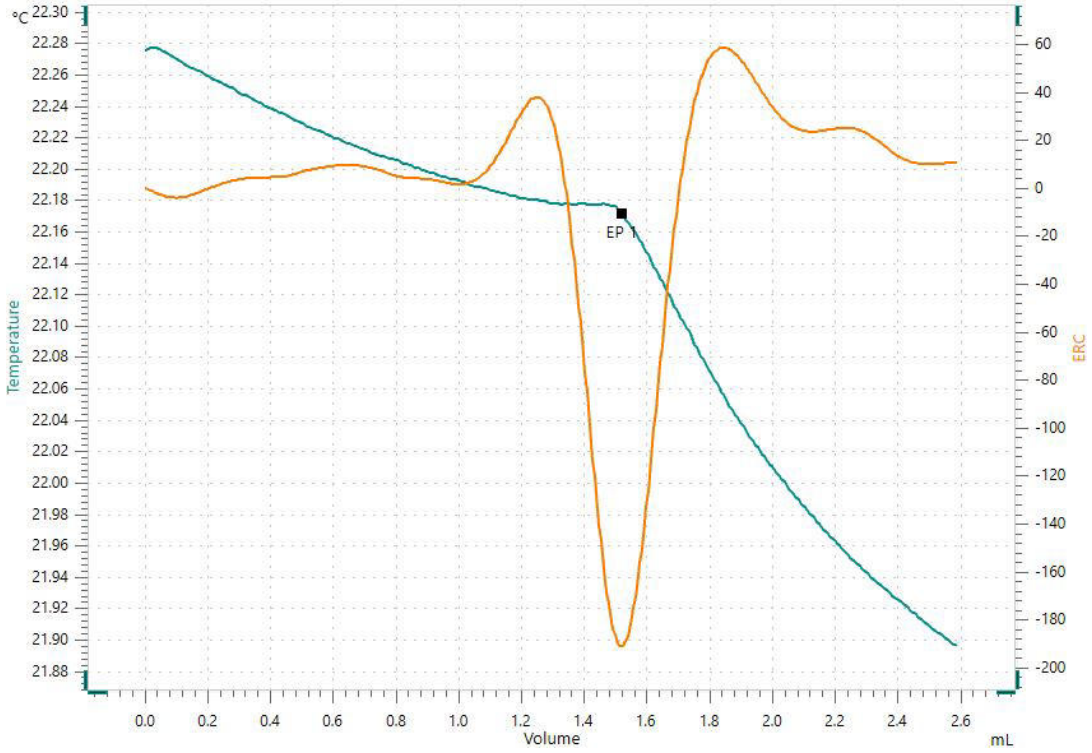

Figure 2. Titration curve of the thermometric determination of a raw crude oil sample.

CONCLUSION

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 Titrator

创新型、模块式电位分析 OMNIS Titrator 滴定仪,适于独立运行或作为 OMNIS 滴定系统的核心元件运行。由于采用 3S 试剂瓶适配器技术,处理化学品很安全。可以使用测量模块和计量管单元自由配置滴定仪,并在需要时扩展一台搅拌器。由于采用不同的软件功能许可证,因此可以有不同的测量模式和功能。

- 通过计算机或本地网络控制
- 可以为其他应用或辅助溶液另外连接四个滴定模块或加液模块
- 螺旋搅拌器的连接方式
- 可提供不同大小的计量管:5、10、20 或 50 mL
- 采用 3S 技术的试剂瓶适配器:安全处理化学品,自动传输生产商的原始试剂数据

测量模式和软件选项:

- 终点设定滴定:“Basic” 功能许可证
- 终点和等当点滴定(单一/动态):“Advanced” 功能许可证
- 终点和等当点滴定(单一/动态),包括平行滴定:“Professional” 功能许可证

dThermoprobe

高灵敏性数字温度探针,用于使用 OMNIS 进行热滴定。

Thermoprobe 温度电极具有较短的响应时间和较高的分辨率,能够精确检测温度变化。

该传感器可以用于不含 HF 的水溶液和非水溶液,例如,测定:

- 酸值 (TAN) 根据 ASTM D8045
- 基数 (TBN)
- 游离脂肪酸
- Ca/Mg 测定
- 磷酸盐

OMNIS 10 mL

智能型计量管单元 10 mL,用于 OMNIS Titrator、Titration Module 或 Dosing Module。该计量管单元专门推荐用于以下溶液:

- 水性碱溶液
- 滴定剂 5
- 硝酸银溶液
- 非水性碱溶液
- 高锰酸钾溶液
- EDTA 溶液

包括计量软管和防扩散滴管。

OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

“温度等当点滴定仪”功能许可证,用于 OMNIS Titrator

包含功能模式

- 温度等当点滴定 (TET)
- MEAS U / T / pH
- 灵快量化液体处理
- 仅使用一个 OMNIS Tritator 的内部滴定管进行滴定