Application Note AN-T-242

Acidity in aviation turbine fuel according to ASTM D3242

Automatic photometric titration with the Optrode

Aviation turbine fuels may contain acids, either from naturally occurring organic compounds or introduced through acid treatment during refining processes. These acids are detrimental even in trace amounts as they can corrode metal components within fuel systems and negatively impact the fuel's ability to effectively separate from water.

The standard method ASTM D3242 determines acidity in aviation turbine fuel with titration, using *p*-naphtholbenzein as a color indicator. The sample is purged with nitrogen gas for three minutes before analysis and the flow is maintained during the titration. Precision may be challenging for inexperienced users due to the small volume of titrant needed and gradual color change close to the endpoint of titration.

This study presents how to fully automate ASTM D3242 using an automatic titrator and the Optrode. The titrator controls a degas box to facilitate the gas to flow and then close the valve at the end of each titration. The results obtained statistically meet the precision criteria defined in the ASTM standard.

SAMPLE AND SAMPLE PREPARATION

To the nearest 0.5 g, weigh 100 g ± 5 g of jet fuel into a 400 mL tall form beaker. Add 100 mL of the titration solvent according to ASTM D3242 and 0.1 mL of the *p*-naphtholbenzein indicator solution. Begin purging the sample with dry-type, carbon dioxide-free nitrogen gas (N_2) at a rate of 400 to 450 mL/min. Purge the solution while continuously mixing for 3 min ± 30 s to remove any carbon dioxide.

EXPERIMENTAL

Start the titration and continue purging the sample with N_2 until the end of the analysis. The monotonic endpoint titration mode – MET U is used.

The titrator adds alcoholic KOH titrant (prepared as per ASTM D3242) to the sample in fixed volume increments—each time waiting for the sensor reading to stabilize before adding the next volume. The equivalence point is indicated by the first derivative of the titration curve (Figure 1).

At the end of the titration, the result is displayed, and the gas flow is stopped.

Table 1. Results of the determination of acidity in jet fuel samples according to ASTM D3242.

No. (n = 5)	Mean value in mg KOH/g	s(abs) in mg KOH/g	s(rel) in %
1	0.0219	0.0001	0.6
2	0.0478	0.0003	0.6
3	0.0839	0.0005	0.6

RESULTS

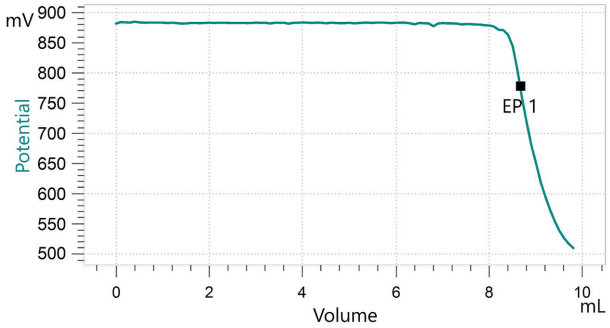

Figure 1. Exemplary titration curve of acidity in jet fuel according to ASTM D3242 using the Optrode at 610 nm for unambiguous endpoint detection.

CONCLUSION

It was possible to fully automate the determination of acidity in aviation fuel by automatic titration, including a sample degassing system that purges the sample with nitrogen before and during the analysis. The results meet the accuracy specifications of ASTM D3242.

CONTACT

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CONFIGURATION

OMNIS Professional Titrator

新型、模式位分析 OMNIS Titrator,于独立行或作 OMNIS 滴定系的核心元件行,用于点和等当点滴定(一/)。由于采用 3S OMNIS Liquid Adapter 技,理化学品从未像在一安全。可以使用量模和量管元自由配置滴定,并在需要展一台棒式拌器。包括用于使用其他滴定或加液模平行滴定的"Professional"功能可。

- 通算机或本地网控制
- 可以其他用或助溶液外接最多四个滴定模或加液模
- 棒式拌器的接方式
- 可提供不同大小的量管:5、10、20 或 50 mL
- 采用 3S 技的 OMNIS Liquid Adapter:安全理化学品,自生厂家的原始数据

量模式和件:

- 点定滴定:"Basic" 功能可
- 点和等当点滴定(一/):"Advanced" 功能可
- 点和等当点滴定(一/),包括 5 路平行滴定:"Professional" 功能可

OMNIS Dosing Module

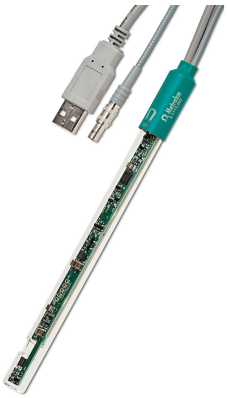
用于与 OMNIS Titrator 滴定相的加液模,以展外用于滴定/加液的滴定管。可以展磁力拌器和/或螺旋拌器,以作独的滴定台使用。可自由 5、10、20 或 50 mL 量管元。

OMNIS 20 mL

智能型量管元 20 mL,用于 OMNIS Titrator、Titration Module 或 Dosing Module。量管元推荐用于以下溶液:

- 水性溶液
- 滴定 5
- 硝酸溶液
- 非水性溶液
- 高酸溶液
- EDTA 溶液

包括量管和防散滴管。



Optrode

有 8 可用波的光度滴定用光学感器。可以通件控制(tiamo 2.5 及以上版本)或通磁来行波切。玻璃鞘溶耐受,并且易于清。省空的感器用于,例如:

- 按照 USP 或 EP 的非水溶性滴定
- 基端基的定
- TAN/TBN 根据 ASTM D974
- 硫酸定
- 混凝土中的 Fe、Al、Ca
- 水硬度
- 根据 USP 的硫酸骨素

感器不合通量色度(比色法)来定度。

OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

OMNIS

允机版 OMNIS 件在一台 WindowsTM 算机上行。

特性:

- 可已含有一 OMNIS 可。
- 通万通可授平台行激活。
- 不可再外算机上使用。