



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 \pm 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 (N₂) at a rate of 400 to 450 mL/min. Purge the solution while continuously mixing for 3 min \pm 30 s to remove any carbon dioxide.

EXPERIMENTAL

Start the titration and continue purging the sample with N₂ 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

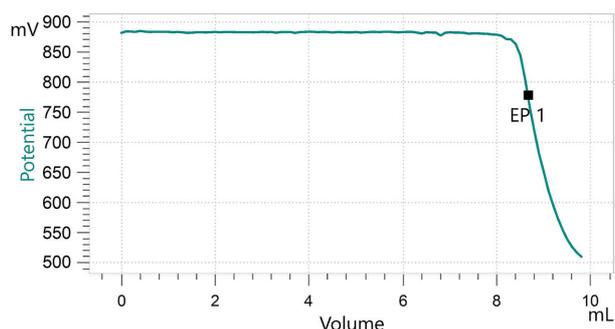


Figure 1. Exemplary titration curve of acidity in jet fuel according to ASTM D3242 using the Optrode at 610 nm for unambiguous endpoint detection.

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

117702
100085

marketing@metrohm.com.cn

CONFIGURATION



OMNIS Professional Titrator

OMNIS Titrator, OMNIS ,(/) 3S OMNIS Liquid Adapter ,,“Professional”

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-
- :51020 50 mL
- 3S OMNIS Liquid Adapter: ,
- :
- :“Basic”
- (/):“Advanced”
- (/), 5 :“Professional”



OMNIS Dosing Module

OMNIS Titrator ,//, 51020 50 mL



OMNIS 20 mL

20 mL, OMNIS Titrator Titration Module Dosing Module:

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- EDTA



Optrode

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- TAN/TBN ASTM D974
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