



Application Note AN-T-247

根据EN 14104标准采用光度滴定法测定生物柴油酸值

Fast and reliable determination of acid value in fatty acid methyl ester (FAME) with the Optrode following EN 14104

Biodiesel, also known chemically as Fatty Acid Methyl Ester or FAME, is a fuel that is used just like mineral diesel. Biodiesel quality needs to be monitored for many reasons.

The acid value (or acid number) is a measurable quality parameter linked to a fuel's purity and stability. A high acid value suggests either prolonged storage or poor biodiesel production quality, both of which can lead to corrosion of engine parts. A low acid value indicates pure,

stable biodiesel.

In this Application Note, an acid value determination of biodiesel was photometrically titrated with the Optrode. The method was performed according to EN 14104. The standard specifies the titrimetric determination of the acid value in lightly colored fatty acid methyl esters (FAME) in the range of 0.10 mg KOH/g sample to 1.00 mg KOH/g sample.

INTRODUCTION

FAME (biodiesel) is a type of fuel produced by transesterification of glycerides present in vegetable or animal fats and oils, as well as in organic waste with monohydric alcohols like methanol or ethanol. In simplified terms, the production process is based on the following reaction:

Oils/Fats + Alcohol → Biodiesel + Glycerine

Compared to petroleum-based diesel, biodiesel produces fewer emissions and is considered

sustainable and climate-friendly. It is primarily made from renewable resources, is biodegradable, and has good lubricating properties.

The acid value in biodiesel should be determined as a quality control measure. Low values are associated with good quality biodiesel, while high values indicate poor quality and a higher likelihood of corrosion from the fuel.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on 100% biodiesel (made from organic waste, e.g., waste

cooking oil).

No sample preparation is required.

EXPERIMENTAL

The determinations are carried out on an OMNIS Professional Titrator equipped with OMNIS Dosing Modules (**Figure 1**) as well as an Optrode M2.

An appropriate amount of sample is weighed into the titration beaker, and pre-neutralized 2-propanol as well as phenolphthalein solution are added. The solution is titrated until after the first break point with standardized potassium hydroxide in 2-propanol.



Figure 1. When equipped with an Optrode M2, the OMNIS Professional Titrator with OMNIS Dosing Modules (shown here) are ideal for acid number determination in biodiesel.

RESULTS

This method offers reliable results that meet the standard's requirements for repeatability and reproducibility within the measurement series, as displayed in **Table 1**. An exemplary titration curve of acid number in biodiesel is given in **Figure 2**.

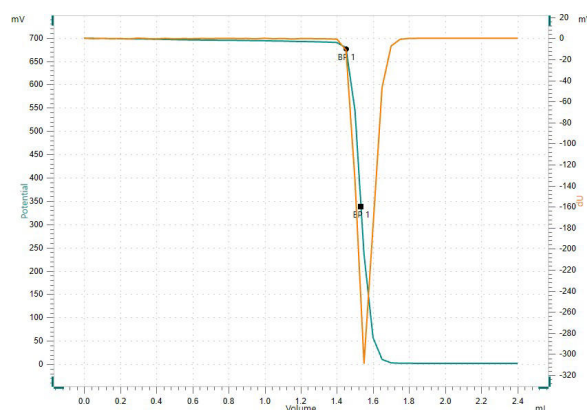


Figure 2. Biodiesel titration for acid value with potassium hydroxide in 2-propanol using the Optrode M2.

Table 1. Results of the photometric titration of acid number in biodiesel (n = 6).

Sample (n = 6)	Acid value in mg KOH/g sample
Mean value	0.41
SD(abs)	0.01
SD(rel) in %	1.8

CONCLUSION

Photometric titration is a fast and reliable test method for determining the acid value of fatty acid methyl ester (FAME). The glass coating of the Optrode is insensitive to chemicals and raw materials (e.g., biodiesel itself), making it ideal for this purpose.

Thanks to the individually adjustable wavelength of the Optrode and the reliable OMNIS Software, acid value determination according to EN 14104 can be achieved even in very low measuring ranges.

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CONFIGURATION



OMNIS Professional Titrator

创新型、模块式电位分析 OMNIS Titrator,用于进行终点和等当点滴定(单一/动态)。由于采用 3S OMNIS Liquid Adapter 技术,处理化学品从未像现在一样安全。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。包括用于使用其他滴定或加液模块平行滴定的“Professional”功能许可证。

- 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最多四个滴定模块或加液模块
- 可以扩展磁力搅拌器和/或棒式搅拌器
- 可提供不同大小的计量管:5、10、20 或 50 mL
- 采用 3S 技术的 OMNIS Liquid Adapter:安全处理化学品,自动传输生产厂家的原始试剂数据

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 5 路平行滴定:“Professional” 功能许可证



OMNIS Dosing Module

用于与 OMNIS Titrator 滴定仪相连的加液模块,以扩展额外用于滴定/加液的滴定管。可以扩展磁力搅拌器和/或螺旋搅拌器,以作为单独的滴定台使用。可自由选择 5、10、20 或 50 mL 计量管单元。



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Optrode M2

有 8 种可用波长的光度滴定法用光学传感器。可以通过软件控制(tiamo 2.5 及以上版本)或通过磁铁来进行波长切换。该玻璃鞘对溶剂完全耐受,并且易于清洁。这种节省空间的传感器适用于例如:

- 按照 USP 或 EP 的非水溶性滴定
- 羧基端基的测定
- TAN/TBN 根据 ASTM D974
- 硫酸测定
- 混凝土中的 Fe、Al、Ca
- 水硬度
- 根据 USP 的硫酸软骨素

传感器不适合通过测量颜色强度(比色法)来测定浓度。