



Application Note AN-NIR-126

近红外光谱技术测定柴油中生物柴油含量

Monitor the fuel blending process within seconds

The properties of biodiesel fuel, which is produced from vegetable oils or animal fat, are very similar to petroleum-derived diesel, but biodiesel pollutes less. In most countries the common biodiesel blend is B20, which ranges from 6% to 20% biodiesel content. Measuring the biodiesel content in diesel is important, as higher levels can cause deposits in older diesel engines, clogging the fuel filters and pumps. Fuels with high levels of biodiesel also tend to

absorb more moisture compared to petroleum-derived fuels. With near-infrared spectroscopy (NIRS), the biodiesel content is determined in seconds without any sample preparation. Compared to other test methods like those used in ASTM D7467, biodiesel content analysis with NIR spectroscopy saves time and enables the implementation of online process monitoring with fiber optics.

EXPERIMENTAL EQUIPMENT

Twenty-one diesel samples with varying biodiesel content from 0% to 20% were measured on the OMNIS NIR Analyzer Liquid (Figure 1) in transmission mode (1000–2250 nm) using 8 mm disposable vials. The vial temperature was set and monitored at 30 ° C with the built-in vial sensor to ensure consistent measurement performance.

OMNIS Software was used for all data acquisition and prediction model development.

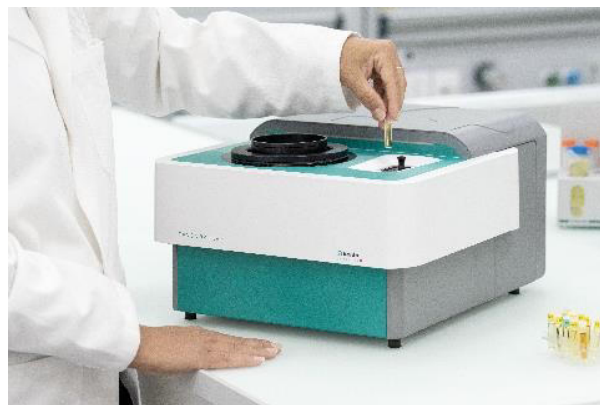


Figure 1. OMNIS NIR Analyzer and a sample filled in a disposable vial.

Table 1. Hardware and software equipment overview.

Equipment	Article number
OMNIS NIR Analyzer Liquid	2.1070.0010
Holder OMNIS NIR, vial, 8 mm	6.07401.070
Disposable vial, 8mm, transmission	6.7402.240
OMNIS Stand-Alone license	6.06003.010
Software license Quant Development	6.06008.002

RESULT

The obtained NIR spectra (Figure 2) were used to create a prediction model for quantification of biodiesel content in diesel. The quality of the prediction model was evaluated using a correlation diagram (Figure 3) which displays a

high correlation between the NIR prediction and the lab method. The respective figures of merit (FOM) confirm the feasibility during routine analysis.

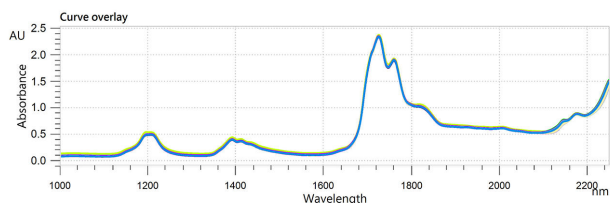


Figure 2. NIR spectra of biodiesel blends analyzed on an OMNIS NIR Analyzer Liquid with 8 mm vials.

Result biodiesel content

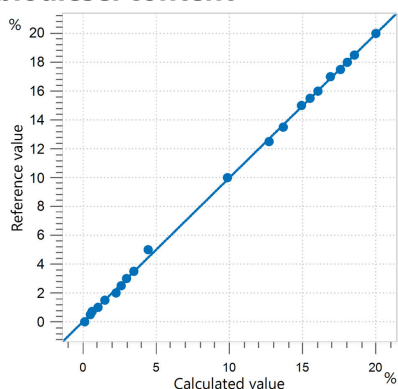


Figure 3. Correlation diagram and the respective FOMs for the prediction of biodiesel content in diesel. The reference value was determined by volumetric mixing of biodiesel and petroleum-derived diesel.

SEC (%)	SECV (%)	R ² CV
0.14	0.16	1.000

CONCLUSION

This Application Note shows the results of a biodiesel content analysis test without the need for any sample preparation, using near-infrared spectroscopy in place of other more time-intensive analytical techniques. This ultimately

leads to a reduction in workload and the related costs. Alongside the biodiesel content test, additional fuel quality parameters like cetane number, moisture, or flash point can be determined with NIRS.

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CONFIGURATION



OMNIS NIR Analyzer Liquid 适合液体样品的近红外光谱仪。

OMNIS NIR Analyzer 是一种按照瑞士质量标准开发和生产的近红外光谱 (NIRS) 解决方案,用于整个生产链的常规分析。使用新技术和嵌入先进 OMNIS Software 反应在该 NIR 光谱仪的速度、可操作性和灵活使用上。

OMNIS NIR Analyzer Liquid 的优点概览:

- 可在 10 秒以内测量液体样品
- 对 25° C – 80° C 的样品进行温度控制
- 自动识别样品容器的插入和取出
- 方便地嵌入自动系统,或者与其它分析技术(滴定)关联
- 支持大量不同路径长度的样品容器

OMNIS NIR8 mm

适合 8 mm 一次性小管的 OMNIS NIR Analyzer 的小管支架 (6.7402.240)。





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A WHOLE NEW LEVEL OF PERFORMANCE

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8 mm 100

100 个玻璃(硼硅)一次性样品瓶,具有 8 mm 的光路长度,适用于分析透射中的液体。一次性样品瓶交付时带有所属的螺旋塞(件数 = 100)。

兼容:

- 支架 OMNIS NIR,小管,8 mm (6.07401.070)
- DS2500 支架适用于 8 mm 一次性样品瓶 (6.7492.020)

OMNIS

允许单机版 OMNIS 软件在一台 Windows™ 计算机上运行。

特性:

- 该许可证已含有一份 OMNIS 设备许可证。
- 须通过万通许可授权平台进行激活。

Quant Development

用于在独立 OMNIS Software 安装套件中编写和编辑量化模型的软件许可证。