

Application Note AN-NIR-118

利用近红外光谱法对纺织品中棉含量的定量分析

Fast, non-destructive cotton content analysis with NIRS

Cotton and polyester are two of the most popular fabrics for creating garments. Polyester is a synthetic material produced from petrochemical products, and cotton is a natural and sustainable fiber harvested from cottonseeds. Of these textile materials, polyester is the best choice of for water-resistant, durable apparel, while cotton is better suited for breathable, cool summer clothing.

Textile products must be labeled according to their fiber composition. The procedures for the determination of fiber composition include mechanical, chemical, and microscopic methods—all of which are time consuming. In contrast, near-infrared spectroscopy (NIRS) is a fast and chemical-free alternative. This Application Note shows how NIR spectroscopy can be used to determine the cotton content in textile products within 30 seconds.

EXPERIMENTAL EQUIPMENT

In this study, 10 textile samples of varying cotton and polyester composition were analyzed with NIR spectroscopy to create a prediction model for quantification of cotton content. Samples were analyzed on a NIR spectrometer (OMNIS NIR Analyzer Solid, Figure 1) in reflection mode (1000–2250 nm) using a large lid and no holder to ensure that the textile samples were evenly pressed against the measurement window. Multi-point measurement was selected as the measuring mode. Data acquisition and prediction model development were performed with OMNIS software.



Figure 1. The OMNIS NIR Analyzer Solid from Metrohm.

Table 1. Hardware and software equipment overview.

Equipment	Article number
OMNIS NIR Analyzer Solid	2.1071.0010
Large lid OMNIS NIR, black, 100 mm	6.07402.110
OMNIS Stand-Alone license	6.06003.010
Quant Development software license	6.06008.002

RESULT

The 10 measured NIR spectra (Figure 2) were used to create a quantification prediction model for the percentage of cotton in different blends of natural and synthetic textiles. The quality of the prediction model was evaluated using a correlation diagram which displays a very high correlation between the NIR prediction and the reference values. The respective figures of merit (FOM) display the expected precision and confirm the feasibility during routine analysis (Figure 3).

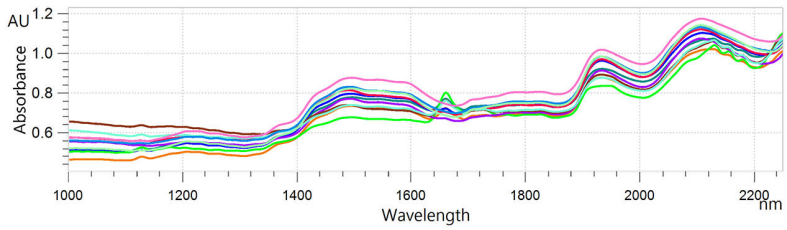


Figure 2. Overlaid NIR spectra of 10 textile samples analyzed on an OMNIS NIR Analyzer Solid.

RESULT COTTON CONTENT IN TEXTILE

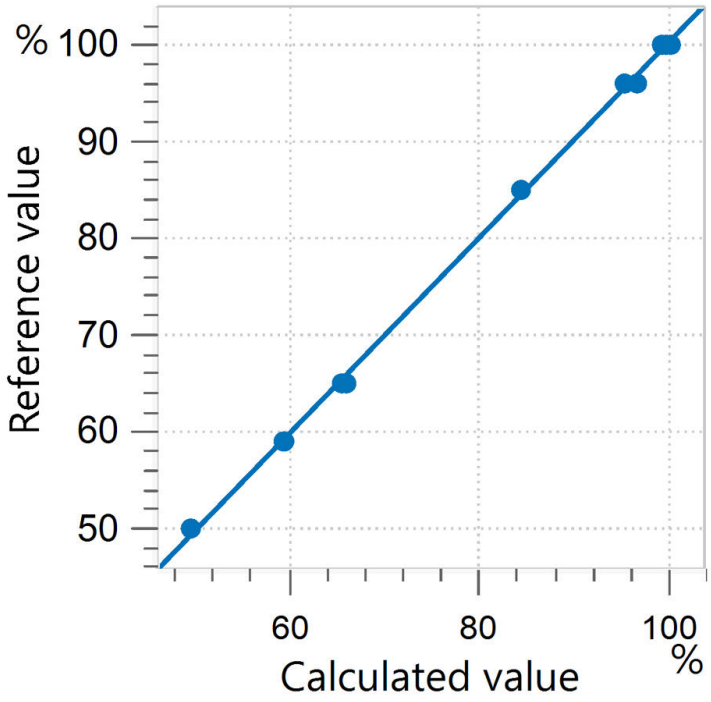


Figure 3. Correlation diagram and the respective figures of merit for the prediction of cotton content in textile using an OMNIS NIR Analyzer Solid.

R^2	SEC (%)	SECV (%)
0.999	0.50	0.59

CONCLUSION

This Application Note demonstrates the feasibility to determine the cotton percentage in textile blends quickly and easily. NIR spectroscopy offers users a fast, cost-effective, and highly accurate alternative to other standard testing methods when identifying textiles. Additionally, NIRS analysis is non-destructive, completely reagent-free, and gives results in only 30 seconds.

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CONFIGURATION



OMNIS NIR Analyzer Solid

用于固体物质和粘稠样品的近红外光谱仪。

OMNIS NIR Analyzer 按照瑞士质量标准开发和制造,是用于整个生产链中常规分析的近红外光谱 (NIRS) 解决方案。最新技术的应用以及与现代 OMNIS Software 的集成,体现在这款 NIR 光谱仪的速度、操作性和灵活应用上。

OMNIS NIR Analyzer Solid 的优势概览:

- 固体物质和粘稠样品测量时间小于 10 秒
- 自动多位置测量,确保即使在非均质样品中也能获得可重现的结果
- 可轻松集成至自动系统,或与其它分析技术(滴定)联用
- 支持多种样品容器



OMNIS NIR100 mm

用于在不同样品位置处通过反射进行粉末和颗粒光谱记录的大样品容器。

玻璃底板由坚固耐用的 Gorilla® 玻璃制成。

兼容:

- 大支架 OMNIS NIR,100 mm (**6.07402.100**)

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允许单机版 OMNIS 软件在一台 WindowsTM 计算机上运行。

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- 须通过万通许可授权平台进行激活。

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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。