Application Note AN-NIR-118

Quantification of cotton content in textiles by near-infrared spectroscopy

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).

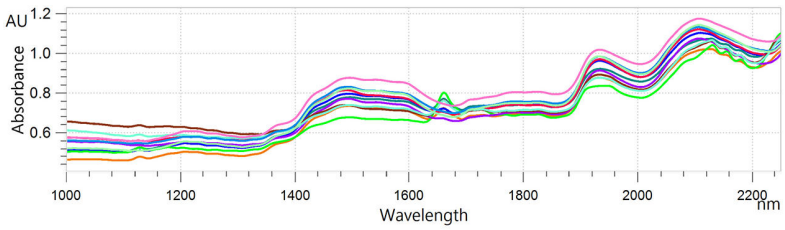

Figure 2. Overlaid NIR spectra of 10 textile samples analyzed on an OMNIS NIR Analyzer Solid.

RESULT COTTON CONTENT IN TEXTILE

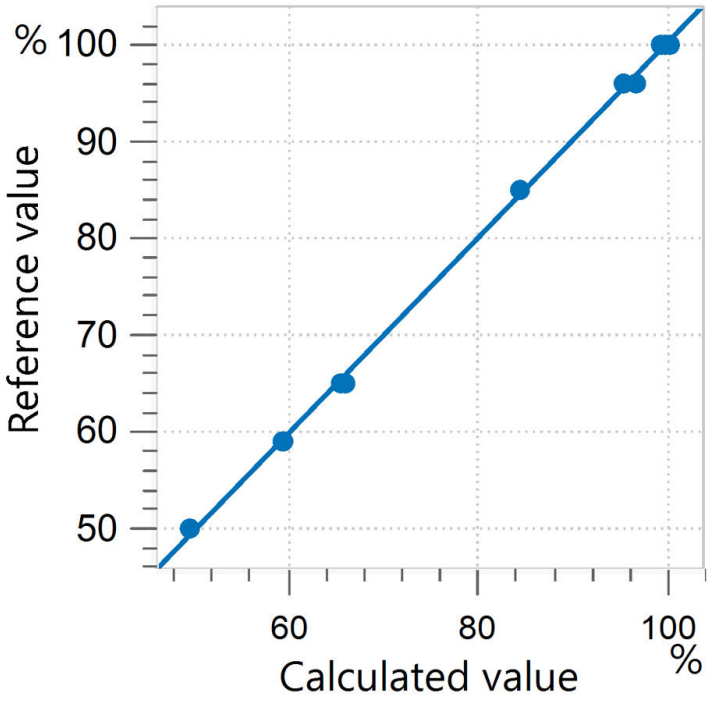

Figure 3. Correlation diagram and the respective figures of merit for the prediction of cotton content in textile using an OMNIS NIR Analyzer Solid.

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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