Application Note AN-NIR-136

Analysis of fabric softeners and laundry perfumes with NIR spectroscopy

Determination of dry matter, pH, and viscosity in seconds

Fabric softeners and laundry perfumes (concentrated fragrances) are a category of personal care/laundry products used for their ability to make textiles softer, smoother, and more pleasantly scented after the washing cycle. A variety of raw materials is necessary to manufacture these products, and different analytical methods are often required before production can commence. Traditional analysis requires time-consuming methods. This Application Note describes how viscosity, dry matter content, and pH level of fabric softeners and laundry perfumes are measured with near-infrared spectroscopy. Near-infrared spectroscopy (NIRS) is a fast, chemical-free analysis technique for quality control of fabric softeners and laundry perfumes without sample preparation.

EXPERIMENTAL EQUIPMENT

Fabric softener and laundry perfume samples were measured with an OMNIS NIR Analyzer Solid (Figure 1) in transflection mode (1000–2250 nm) using a 1 mm gap size reflector and 28 mm disposable vials.

Reference values of dry matter were measured by loss on drying, and pH and viscosity were determined with a pH meter and viscometer, respectively.

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

Figure 1. OMNIS NIR Analyzer Solid with transflection vessel and large reflector

RESULT

The obtained NIR spectra (Figure 2) were used to create prediction models for quantification of dry matter, pH value, and viscosity. The quality of the prediction models was evaluated using correlation diagrams (Figures 3–5) which display a very high correlation between the NIR prediction and the reference values. The respective figures of merit (FOM) display the expected precision of a prediction during routine analysis.

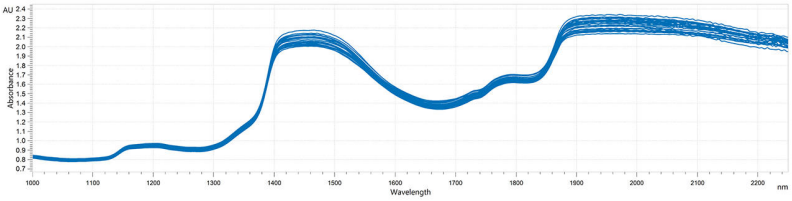

Figure 2. NIR spectra of fabric softeners and laundry perfumes analyzed on OMNIS NIR Analyzer Solid

Result pH in fabric softeners and laundry perfumes

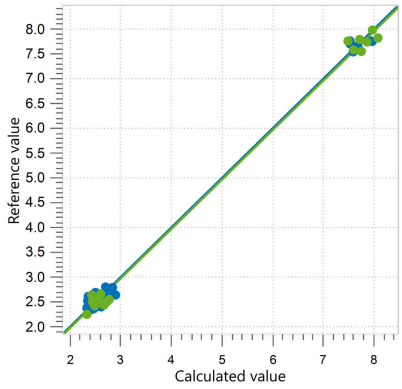

Figure 3. Correlation diagram and the respective FOMs for the prediction of pH value in fabric softeners and laundry perfumes using an OMNIS NIR Analyzer Solid. The correlation set is shown in blue, and the external validation set is in green.

R^2	SEC	SECV	SEP
0.997	0.11	0.14	0.15

Result dry matter in fabric softeners and laundry perfumes

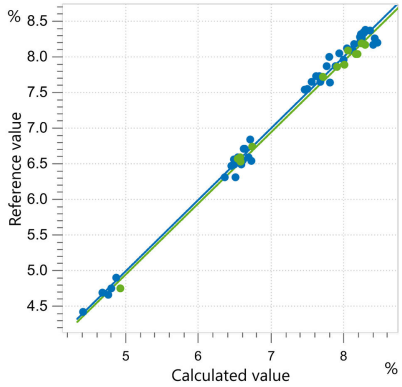

Figure 4. Correlation diagram and the respective FOMs for the prediction of dry matter in fabric softeners and laundry perfumes using an OMNIS NIR Analyzer Solid. The correlation set is shown in blue, and the external validation set is in green.

R^2	SEC (%)	SECV (%)	SEP (%)
0.995	0.09	0.10	0.09

Result viscosity in fabric softeners and laundry perfumes

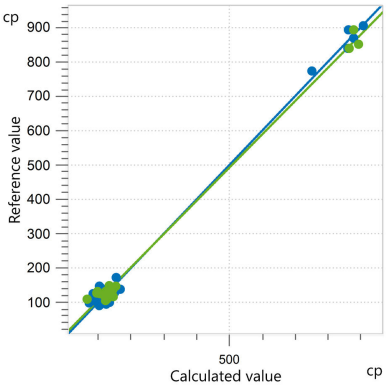

Figure 5. Correlation diagram and the respective FOMs for the prediction of viscosity in fabric softeners and laundry perfumes using an OMNIS NIR Analyzer Solid. The correlation set is shown in blue, and the external validation set is in green.

R^2	SEC (cp)	SECV (cp)	SEP (cp)
0.994	17.16	20.25	22.18

CONCLUSION

This Application Note shows the feasibility of the analysis of dry matter, pH, and viscosity in laundry perfumes and fabric softeners with near-infrared spectroscopy. Measurement of all three quality parameters can be conducted within seconds without using any chemicals.

NIRS can be used in several steps of the production chain or during quality control of the final product, saving manufacturers time and money. Additionally, with NIRS only one technology is required, compared to the standard analytical techniques often used for these determinations (Table 1).

Table 1. Overview of standard methods used for the determination of different reference values in fabric softeners and laundry perfumes.

Parameter	Method	Time to result
Dry matter	Loss on drying	30 min
pH	pH meter	5 min
Viscosity	Viscometer	15 min (sample preparation + measurement)

CONTACT

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CONFIGURATION

OMNIS NIR Analyzer Solid

固体および粘性のサンフルのための近赤外スヘクトロメーター。

OMNIS NIR Analyzer は、スイスの品質基準に従って開発・製造された、生産チェーン全体に沿ったルーチン分析のための近赤外分光法 (NIRS) ソリューションてす。最新技術の適用と最新の OMNIS Software への統合は、この NIR スヘクトロメーターの速度、ユーサヒリティ、柔軟な使用に反映されています。

OMNIS NIR Analyzer Solid の利点の概要:

- 10秒未満て固体サンフルと粘性サンフルを測定
- 不均質なサンフルても再現性のある結果を得るための自動マルチホシション測定
- オートメーションシステムへの統合、またはその他の分析技術 (滴定) との連結か容易
- 多数のサンフル容器に対応

OMNIS NIR1 mm

リフレクター、キャップサイス 1 mm (光路長 2 mm)、液体のトランスフレクション測定用。

28 mm 反射の使い捨てハイアル (6.7402.140) に適しています。

28 mm

反射された固形物を分析するための直径 28mm の密封可能なカラス製使い捨てハイアル 216 個。以下のアナライサーに適しています:

- NIRS DS2500 Analyzer
- NIRS XDS RapidContent (Solid) Analyzer
- NIRS XDS MultiVial Analyzer
- NIRS XDS Masterlab Analyzer

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A WHOLE NEW LEVEL OF PERFORMANCE

OMNIS

WindowsTMコンヒューター上のOMNISソフトウェアをスタントアローン操作することか可能になります。

特徴:

- ライセンスには、既に1つのOMNISテハイスライセンスか含まれています。
- メトローム・ライセンシンクホータルにて、アクティフ化する必要かあります。
- 他のコンヒューターに移行することはてきません。

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Quant Development

スタントアロン型 OMNIS Software のインストールにおける定量化モテルの作成と編集のためのソフトウェアライセンス。