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.

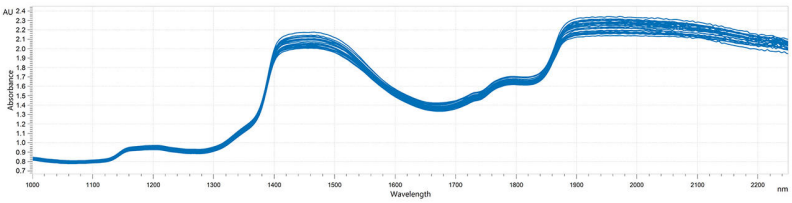

Figure 2. NIR spectra of fabric softeners and laundry perfumes analyzed on OMNIS NIR Analyzer Solid

Result pH in fabric softeners and laundry perfumes

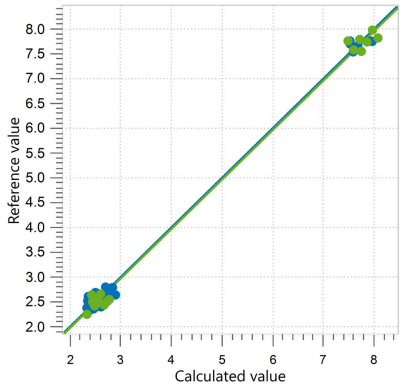

Figure 3. Correlation diagram and the respective FOMs for the prediction of pH value in fabric softeners and laundry perfumes using an OMNIS NIR Analyzer Solid. The correlation set is shown in blue, and the external validation set is in green.

R^2	SEC	SECV	SEP
0.997	0.11	0.14	0.15

Result dry matter in fabric softeners and laundry perfumes

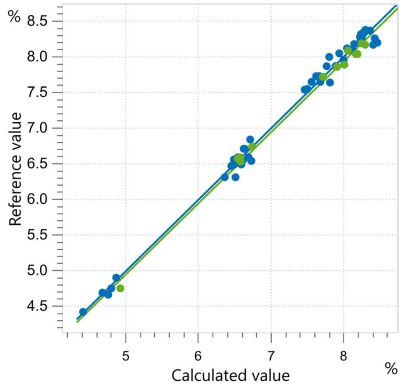

Figure 4. Correlation diagram and the respective FOMs for the prediction of dry matter in fabric softeners and laundry perfumes using an OMNIS NIR Analyzer Solid. The correlation set is shown in blue, and the external validation set is in green.

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

Result viscosity in fabric softeners and laundry perfumes

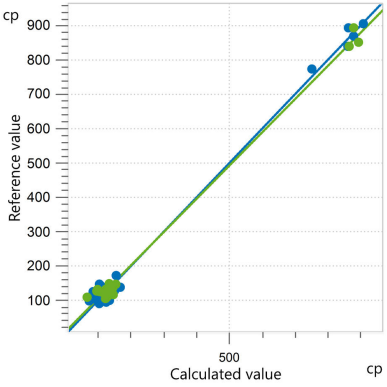

Figure 5. Correlation diagram and the respective FOMs for the prediction of viscosity in fabric softeners and laundry perfumes using an OMNIS NIR Analyzer Solid. The correlation set is shown in blue, and the external validation set is in green.

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

Metrohm France
13, avenue du Québec - CS 90038
91978 VILLEBON COURTABOEUF CEDEX
info@metrohm.fr

CONFIGURATION

OMNIS NIR Analyzer Solid

Spectromètre proche infrarouge pour échantillons solides et visqueux.

L'OMNIS NIR Analyzer est la solution de spectroscopie proche infrarouge (NIRS) développée et produite selon les normes de qualité suisses pour les analyses de routine tout au long de la chaine de fabrication. L'utilisation des technologies les plus récentes et l'intégration dans le logiciel OMNIS moderne se reflètent dans la vitesse, la facilité d'utilisation et la flexibilité d'utilisation de ces spectromètres NIR.

Vue d'ensemble des avantages de l'OMNIS NIR Analyzer Solid :

- Mesures d'échantillons solides et visqueux en moins de 10 secondes
- Mesures multi-positions automatisées pour des résultats reproductibles même avec des échantillons non homogènes
- Intégration simple dans un système d'automatisation ou liaison avec d'autres technologies d'analyse (titrage)
- Prise en charge de nombreux récipients d'échantillon

Petit réflecteur OMNIS NIR, 1 mm

Réflecteur avec une dimension de fente de 1 mm (longueur de chemin optique de 2 mm) pour la mesure par transflexion des liquides.

Compatible avec les flacons à usage unique 28 mm réflexion (6.7402.140).

Flacons à usage unique, 28 mm, réflexion

216 flacons en verre à usage unique, pouvant être refermés, d'un diamètre de 28 mm pour des analyses de matières solides par réflexion. Convient aux appareils d'analyse suivants :

- 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

Licence OMNIS autonome

Elle permet l'exploitation autonome du logiciel OMNIS sur un ordinateur WindowsTM.

Caractéristiques :

- La licence comprend déjà une licence pour appareils OMNIS.
- Elle doit être activée via le portail d'octroi de licences Metrohm.

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Licence logicielle Quant Development

Licence logicielle pour la création et l'édition de modèles de quantification dans une installation du logiciel OMNIS Stand-Alone.