



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.

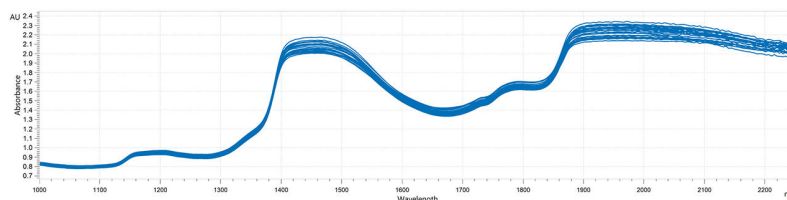


Figure 2. NIR spectra of fabric softeners and laundry perfumes analyzed on OMNIS NIR Analyzer Solid

Result pH in fabric softeners and laundry perfumes

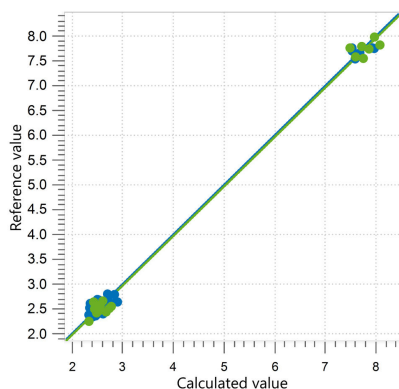


Figure 3. Correlation diagram and the respective FOMs for the prediction of pH value in fabric softeners and laundry perfumes using an OMNIS NIR Analyzer Solid. The correlation set is shown in blue, and the external validation set is in green.

R^2	SEC	SECV	SEP
0.997	0.11	0.14	0.15

Result dry matter in fabric softeners and laundry perfumes

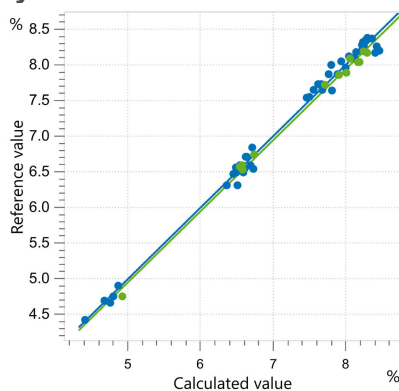


Figure 4. Correlation diagram and the respective FOMs for the prediction of dry matter in fabric softeners and laundry perfumes using an OMNIS NIR Analyzer Solid. The correlation set is shown in blue, and the external validation set is in green.

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 Italiana Srl
Via G. Di Vittorio, 5
21040 Origgio (VA)

info@metrohm.it

CONFIGURATION



OMNIS NIR Analyzer Solid

Spettrometro nel vicino infrarosso per campioni solidi e viscosi.

OMNIS NIR Analyzer è la soluzione per spettroscopia nel vicino infrarosso (NIRS) sviluppata e prodotta secondo gli standard di qualità svizzeri utilizzabile per l'analisi di routine lungo l'intera catena di produzione. L'uso delle più recenti tecnologie e l'integrazione nel moderno OMNIS Software si riflettono nella velocità, operatività e flessibilità d'uso di questo spettrometro NIR.

Panoramica dei vantaggi di OMNIS NIR Analyzer Solid:

- Misurazioni di materie solide e campioni viscosi in meno di 10 secondi
- Misurazioni automatiche su più posizioni per risultati riproducibili anche in caso di campioni non omogenei
- Facile integrazione in un sistema di automazione o collegamento con altre tecnologie di analisi (titolazione)
- Supporto di numerosi contenitori portacampione



Riflettore piccolo OMNIS NIR, 1 mm

Riflettore con fessura di 1 mm (lunghezza del cammino ottico di 2 mm) per la misura della transflessione di liquidi.

Adatto alla riflessione in vial monouso da 28 mm (6.7402.140).



Vial monouso, 28 mm, riflessione

216 vial monouso in vetro richiudibili con diametro di 28 mm per l'analisi di solidi in riflessione. Adatti ai seguenti analizzatori:

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

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

Licenza OMNIS Stand-Alone

Consente l'utilizzo stand-alone del software OMNIS su un computer Windows™.

Caratteristiche:

- la licenza contiene già una licenza per strumenti OMNIS.
- Deve essere attivata tramite il portale licenze Metrohm.
- Non è trasferibile su di un altro computer.

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

Licenza software Quant Development

Licenza software per la creazione e l'elaborazione di modelli di quantificazione in un'installazione Stand-Alone di OMNIS Software.