



Application Note AN-NIR-092

# Quality Control of PVC foils

## Easy and robust determination of PVDC layer thickness

PVC (polyvinyl chloride) foils with a PVDC (polyvinylidene chloride) coating are often used for high performance packaging films like pharmaceutical blister packs or in food packaging. In multi-layer blister films, the PVC serves as the thermoformable backbone structure, whereas the PVDC coating acts as a barrier against moisture and oxygen. The Water

Vapor Transmission Rate (WVTR) and Oxygen Transmission Rate (OTR) are influenced by the composition and the thickness of the coating.

A fast way to monitor PVDC coating thickness is with near-infrared spectroscopy. Results are provided **in a few seconds**, indicating when adjustments in the polymer production process are necessary.

## EXPERIMENTAL EQUIPMENT

Several 250  $\mu\text{m}$  PVC foils coated with a PVDC layer of varying thickness (40  $\text{g}/\text{m}^2$ , 60  $\text{g}/\text{m}^2$ , 90  $\text{g}/\text{m}^2$ ) were measured on the DS2500 Solid Analyzer. The measurements were carried out in transfection mode using the NIRS gold diffuse reflector with 1 mm pathlength. This ensures that the spectral pathlength is constant while enhancing the spectral signal. The Metrohm software package Vision Air Complete was used for all data acquisition and prediction model development.



**Figure 1.** DS2500 Solid Analyzer

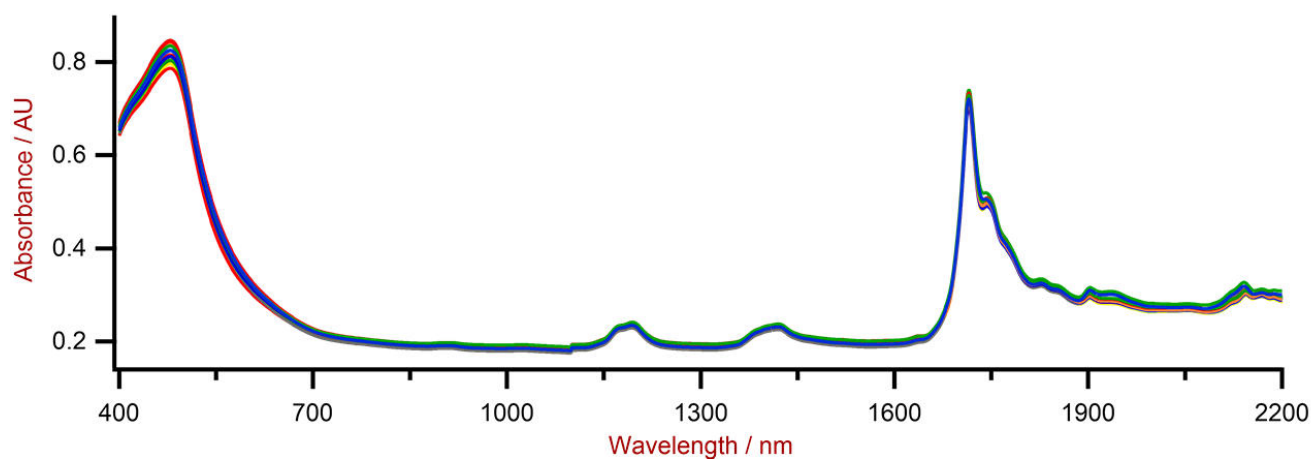
**Table 1.** Hardware and software equipment overview

Equipment	Metrohm number
NIRS DS2500 Solid Analyzer	2.922.0010
Vision Air 2.0 Complete	6.6072.208
NIRS gold diffuse reflector, 1 mm	6.7420.000
NIRS mini sample cup	6.7402.030

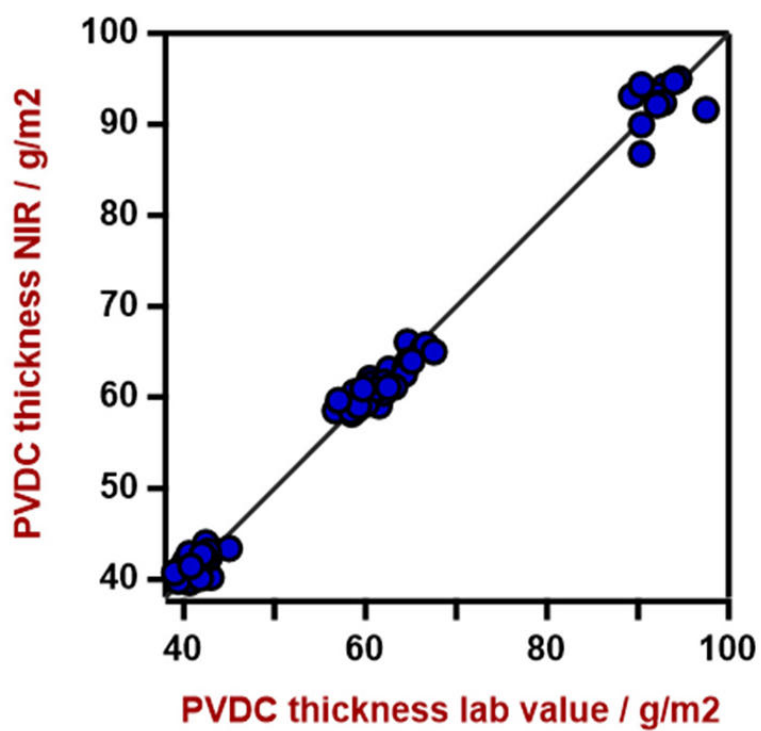
## RESULT

All 68 measured Vis-NIR spectra (**Figure 2**) were used to create a prediction model for quantification of PVDC layer thickness. The quality of the prediction model was evaluated using correlation diagrams, which display a very high correlation

between Vis-NIR prediction and the reference values. The respective figures of merit (FOM) display the expected precision of a prediction during routine analysis.



**Figure 2.** Vis-NIR spectra of PVC foils with different PVDC layer thicknesses measured on a DS2500 Solid Analyzer.



**Figure 3.** Correlation diagram for the prediction of PVDC layer thickness using a DS2500 Solid Analyzer.

**Table 2.** Figures of merit for the prediction of PVDC layer thickness using a DS2500 Solid Analyzer.

Figures of merit	Value
$R^2$	0.992
Standard error of calibration	1.7 g/m <sup>2</sup>
Standard error of cross-validation	1.9 g/m <sup>2</sup>

## CONCLUSION

This application note demonstrates the feasibility of differentiating PVC foils coated with different PVDC layer thickness (40, 60, 90 g/m<sup>2</sup> PVDC on 250 µm PVC foils). The thickness of the PVDC layer could be successfully determined with NIR spectroscopy with an average

difference with respect to the reference data of 2%. Vis-NIR spectroscopy enables a fast determination without any sample preparation, and therefore represents a suitable method to measure PVDC layer thickness.

## CONTACT

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## EXPERIMENTAL EQUIPMENT



### DS2500 Solid Analyzer

DS2500 Analyzer  
DS2500400 ~ 2500 nm1  
9MultiSample Cup



## Vision Air 2.0 Complete

### Vision Air -

Vision Air Complete

Vision Air :

- 
- 
- SQL

Vision Air Complete (66072208) :

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- 
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Vision Air Complete :

- 66072207 (Vision Air Network Complete)
- 66072209 (Vision Air Pharma Complete)
- 66072210 (Vision Air Pharma Network Complete)



## NIRS 1 mm

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- NIRS DS2500 Analyzer (: **2.922.0010**)
- NIRS XDS MasterLab Analyzer (: **2.921.1310**)
- NIRS XDS MultiVial Analyzer (: **2.921.1120**)
- NIRS XDS RapidContent Analyzer (: **2.921.1110**)
- NIRS XDS RapidContent Analyzer - Solids (: **2.921.1210**)



## NIRS10(100)

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- NIRS DS2500 Analyzer (: 2.922.0010)
- NIRS XDS MasterLab Analyzer (: 2.921.1310)
- NIRS XDS MultiVial Analyzer (: 2.921.1120)
- NIRS XDS RapidContent Analyzer (: 2.921.1110)
- NIRS XDS RapidContent Analyzer - Solids (: 2.921.1210)