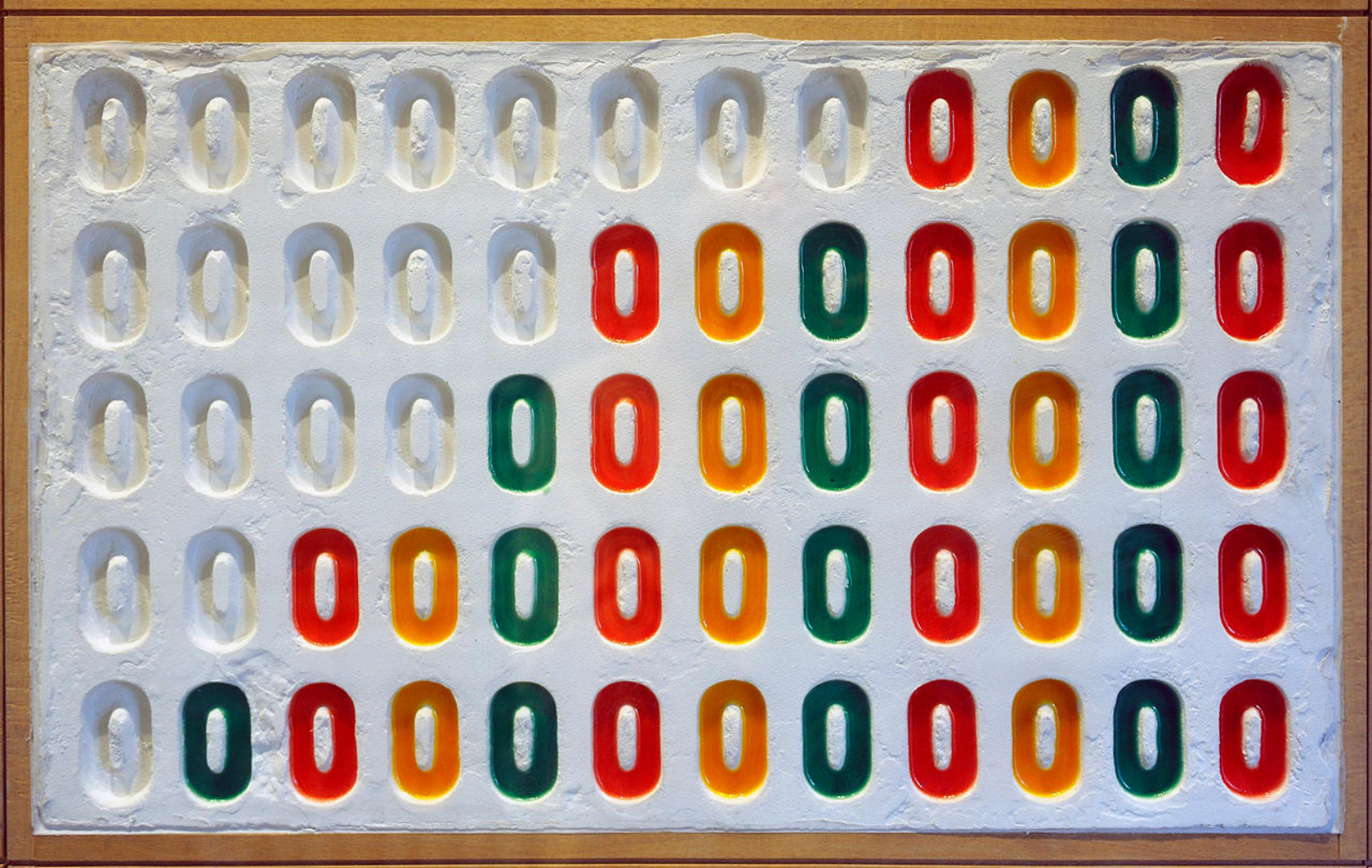




Application Note AN-NIR-151

# Moisture and protein content in corn starch with NIR spectroscopy

Easily measure the quality of corn starch in seconds with NIR

Starch is a fundamental component in candy production where it is often used as a gelling agent and thickener. The confectionery industry uses it to create products with a certain consistency, like pie fillings. It is also used in a process known as starch molding where shapes are pressed into a corn starch bed for gummy candies and similar treats. Corn starch also acts as a desiccant during the candies' drying

process before reuse. Therefore, the corn starch moisture content is a very important factor to consider in this process.

Near-infrared spectroscopy (NIRS) is a fast, chemical-free analysis technique for the determination of moisture content and corn protein content in corn starch. The NIRS solution is easy to use and can be used either atline or in a quality control laboratory.

## EXPERIMENTAL EQUIPMENT

210 samples of corn starch were measured with an OMNIS NIR Analyzer Solid (Figure 1). All measurements were performed in reflection mode (1000–2250 nm) using a large holder and large cup (Table 1). OMNIS Software was used for all data acquisition and prediction model development. Karl Fischer titration was used to determine the water content in corn starch, and the Kjeldahl method was used to determine its protein content.



**Figure 1.** OMNIS NIR Analyzer Solid.

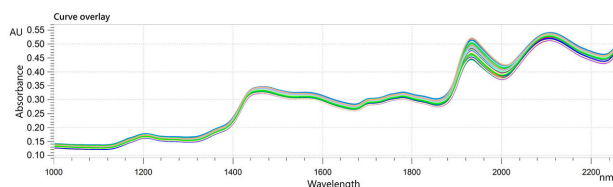
**Table 1.** Hardware and software equipment overview.

| Equipment                          | Article number |
|------------------------------------|----------------|
| OMNIS NIR Analyzer Solid           | 2.1071.0010    |
| Large holder OMNIS NIR, 100 mm     | 6.07402.100    |
| Large cup OMNIS NIR, 100 mm        | 6.07402.110    |
| OMNIS Stand-Alone license          | 6.06003.010    |
| Software license Quant Development | 6.06008.002    |

## RESULT

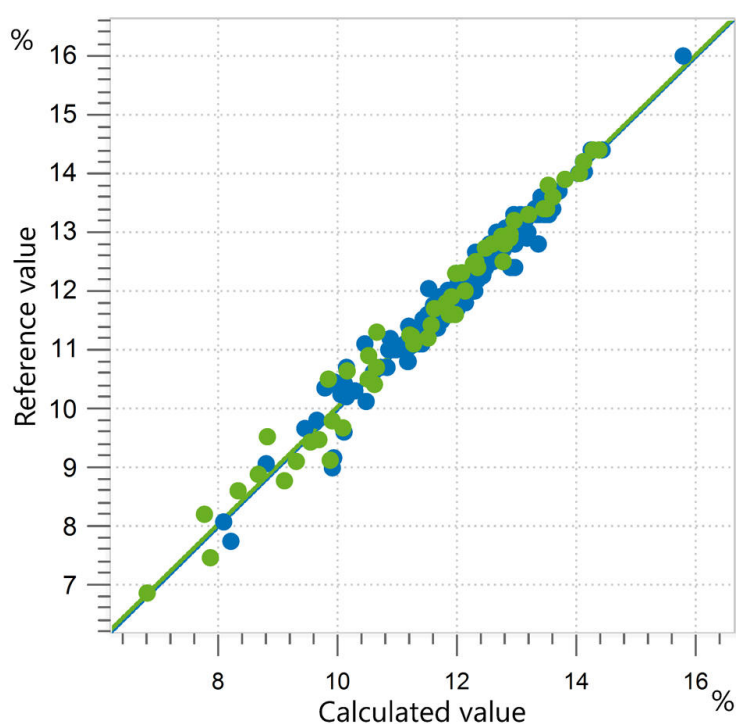
The obtained NIR spectra (Figure 2) were used to create prediction models for both moisture and protein content in corn starch. An external validation procedure was used.

Correlation diagrams which display the relation between the NIR prediction and the reference values are shown in Figures 3 and 4 together with the respective figures of merit (FOM).



**Figure 2.** Selection of NIR spectra from starch samples measured in this study. Data was obtained with an OMNIS NIR Analyzer Solid.

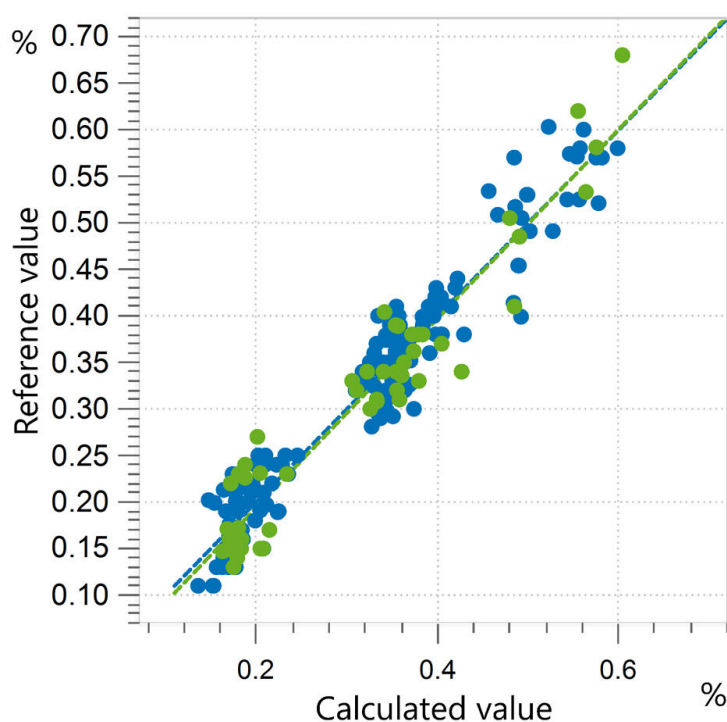
## RESULT MOISTURE CONTENT IN CORN STARCH



**Figure 3.** Correlation diagram and the respective figures of merit for the prediction of moisture content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with Karl Fischer titration.

| $R^2$ | SEC (%) | SECV (%) | SEP (%) |
|-------|---------|----------|---------|
| 0.977 | 0.21    | 0.23     | 0.28    |

## RESULT PROTEIN CONTENT IN CORN STARCH



**Figure 4.** Correlation diagram and the respective figures of merit for the prediction of protein content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with the Kjeldahl method.

| $R^2$ | SEC (%) | SECV (%) | SEP (%) |
|-------|---------|----------|---------|
| 0.915 | 0.032   | 0.033    | 0.038   |

## CONCLUSION

This Application Note shows the feasibility of using near-infrared spectroscopy for the determination of moisture and protein content in corn starch. Compared to the conventional analysis techniques used to determine these quality parameters, NIRS

saves a considerable amount of time and costs.

With NIR spectroscopy, analyses can be conducted without using any chemical reagents, giving users reliable results in seconds.

## CONTACT

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

[info@metrohm.it](mailto: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



### Supporto grande OMNIS NIR, 100 mm

Supporto grande per contenitore portacampione grande OMNIS NIR, 100 mm (6.07402.110).

Permette il posizionamento chiaro del contenitore portacampione e la rotazione dello stesso.





OMNIS  
A WHOLE NEW LEVEL OF PERFORMANCE

OMNIS  
A WHOLE NEW LEVEL OF PERFORMANCE

#### Tazza grande OMNIS NIR, 100 mm

Contenitore portacampione grande per la rilevazione degli spettri di polveri e granulati in riflessione in punti diversi del campione.

Compatibile con:

- Supporto grande OMNIS NIR, 100 mm (6.07402.100)

#### 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.

#### Licenza software Quant Development

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