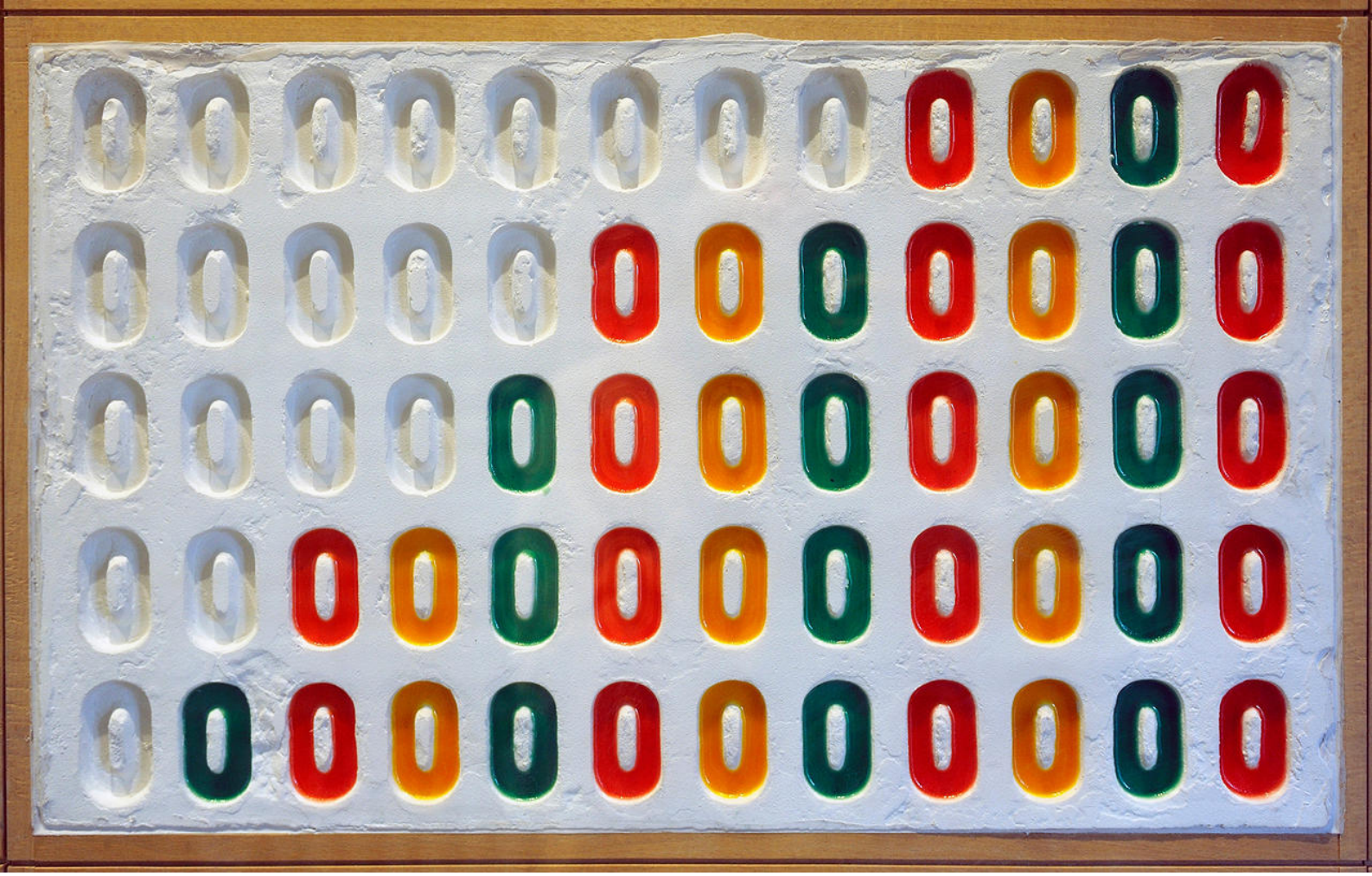


Application Note AN-NIR-151

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).

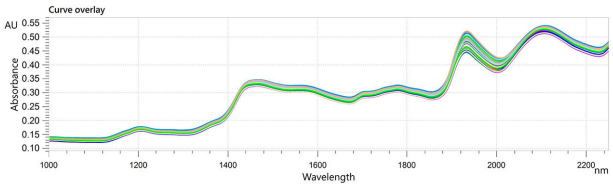


Figure 2. Selection of NIR spectra from starch samples measured in this study. Data was obtained with an OMNIS NIR Analyzer Solid.

RESULT MOISTURE CONTENT IN CORN STARCH

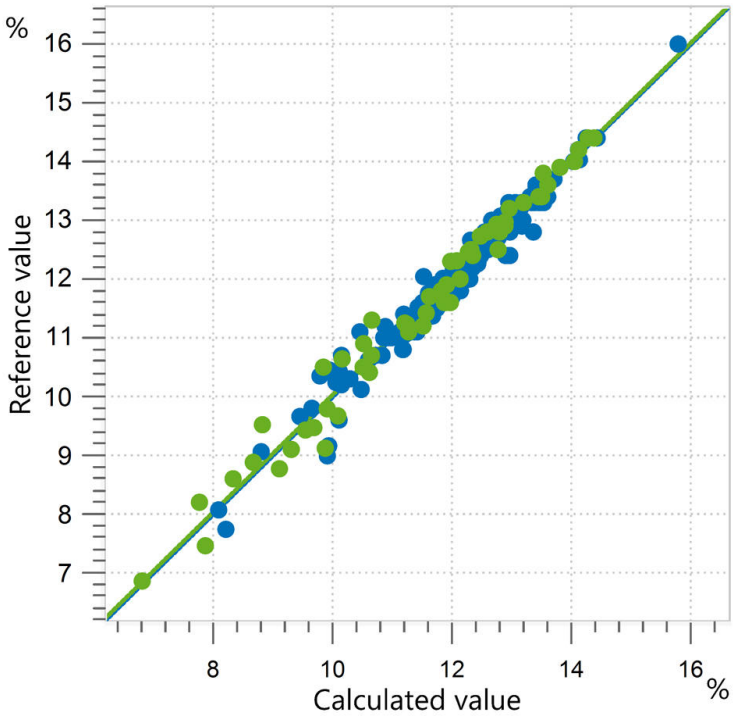


Figure 3. Correlation diagram and the respective figures of merit for the prediction of moisture content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with Karl Fischer titration.

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

RESULT PROTEIN CONTENT IN CORN STARCH

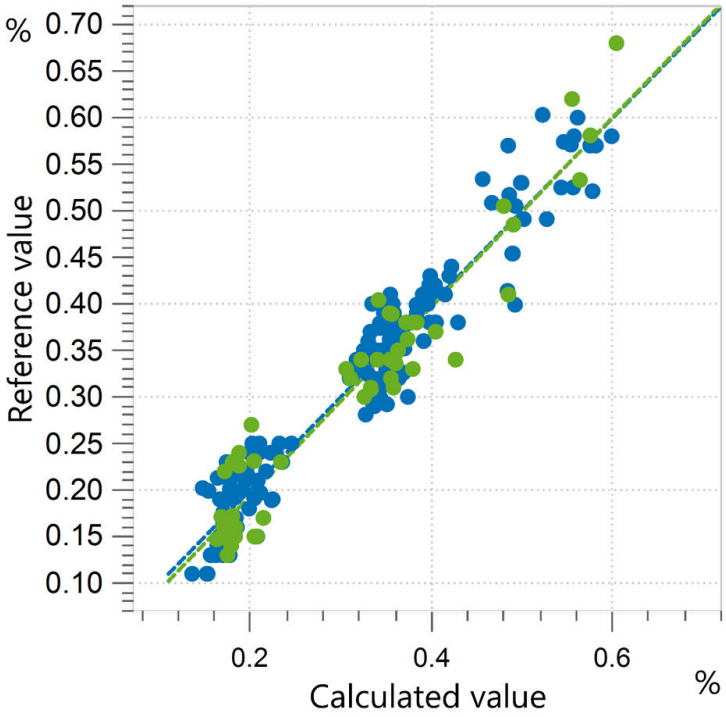


Figure 4. Correlation diagram and the respective figures of merit for the prediction of protein content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with the Kjeldahl method.

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.

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CONFIGURATION



OMNIS NIR Analyzer Solid

Near-infrared spectrometer for solid and viscous samples.

Developed and produced in accordance with Swiss quality standards, the OMNIS NIR Analyzer is the near-infrared spectroscopy (NIRS) solution for routine analysis along the entire production chain. Its application of the latest technologies and its integration in the modern OMNIS Software are reflected in its speed, operability and flexible utilization of this NIR spectrometer.

Overview of the advantages of the OMNIS NIR Analyzer Solid:

- Measurements of solids and viscous samples in less than 10 seconds
- Automated multi-position measurements for reproducible results, even with nonhomogeneous samples
- Simple integration in an automation system or link with additional analysis technologies (titration)
- Supports numerous sample vessels



Large holder OMNIS NIR, 100 mm

Large holder for large sample vessel OMNIS NIR, 100 mm (6.07402.110).

Permits unambiguous positioning of the sample vessel and the rotation of the sample vessel.



Large cup OMNIS NIR, 100 mm

Large sample vessel for the spectra acquisition of powders and granulates in reflection at various sample positions.

The glass bottom is made of resistant Gorilla® Glass.

Compatible with:

- Large holder OMNIS NIR, 100 mm (6.07402.100)

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

OMNIS Stand-Alone license

Enables stand-alone operation of the OMNIS software on a WindowsTM computer.

Features:

- The license already includes one OMNIS instrument license.
- Must be activated via the Metrohm licensing portal.

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

Software license Quant Development

Software license for the creation and editing of quantification models in a stand-alone OMNIS Software installation.