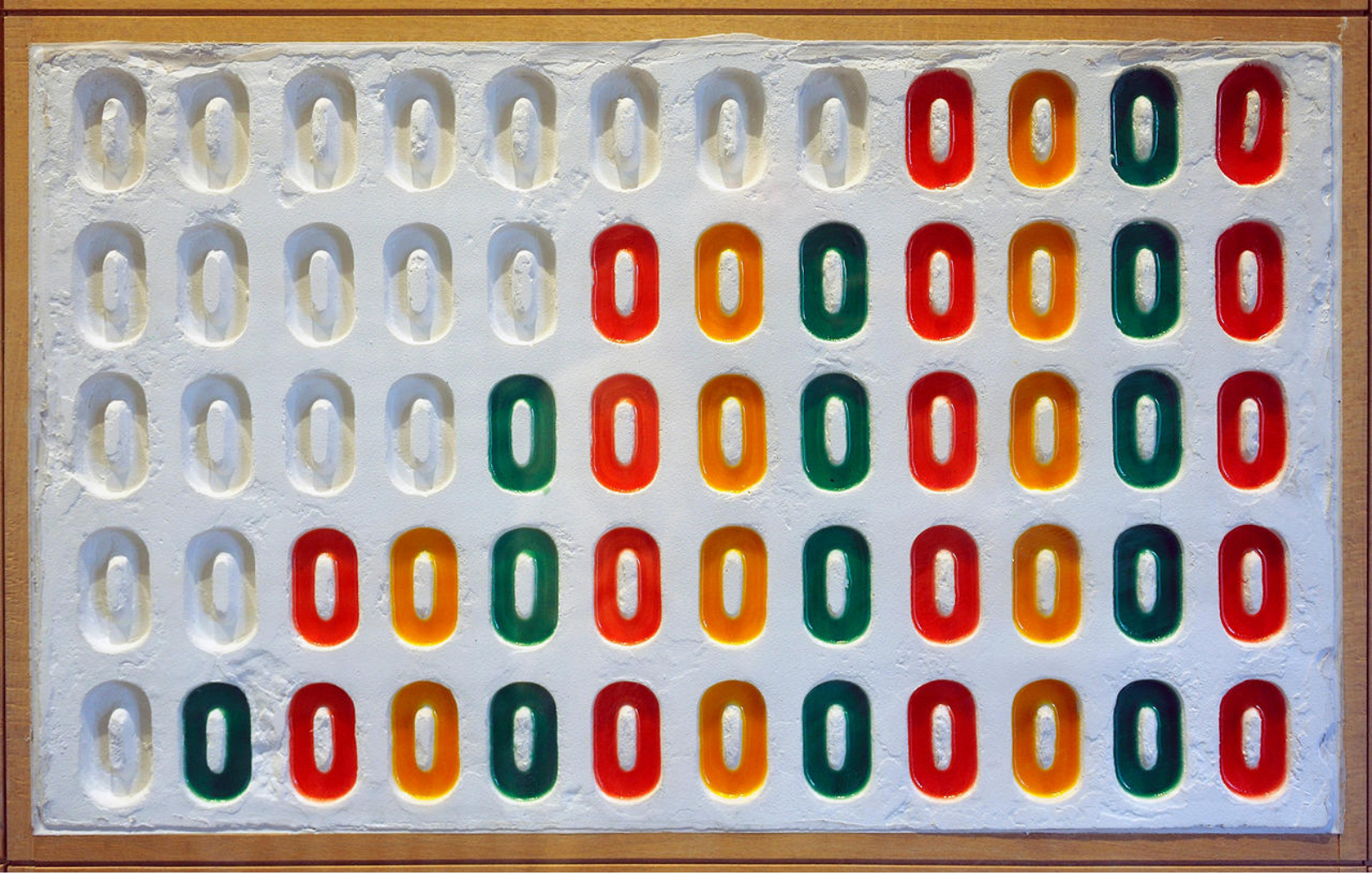


Application Note AN-NIR-151

近红外光谱法检测玉米淀粉水分与蛋白质含量

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).

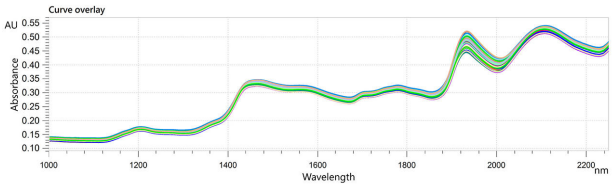


Figure 2. Selection of NIR spectra from starch samples measured in this study. Data was obtained with an OMNIS NIR Analyzer Solid.

RESULT MOISTURE CONTENT IN CORN STARCH

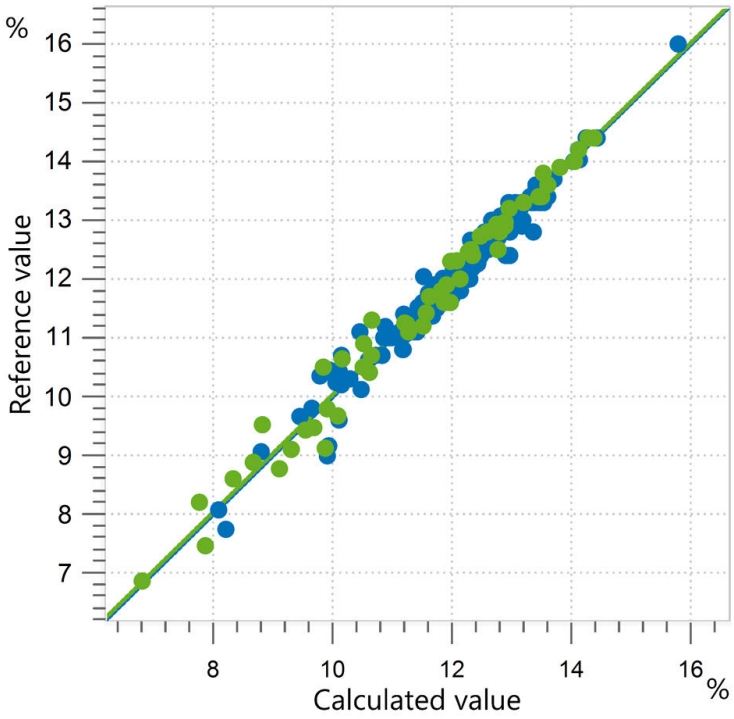


Figure 3. Correlation diagram and the respective figures of merit for the prediction of moisture content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with Karl Fischer titration.

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

RESULT PROTEIN CONTENT IN CORN STARCH

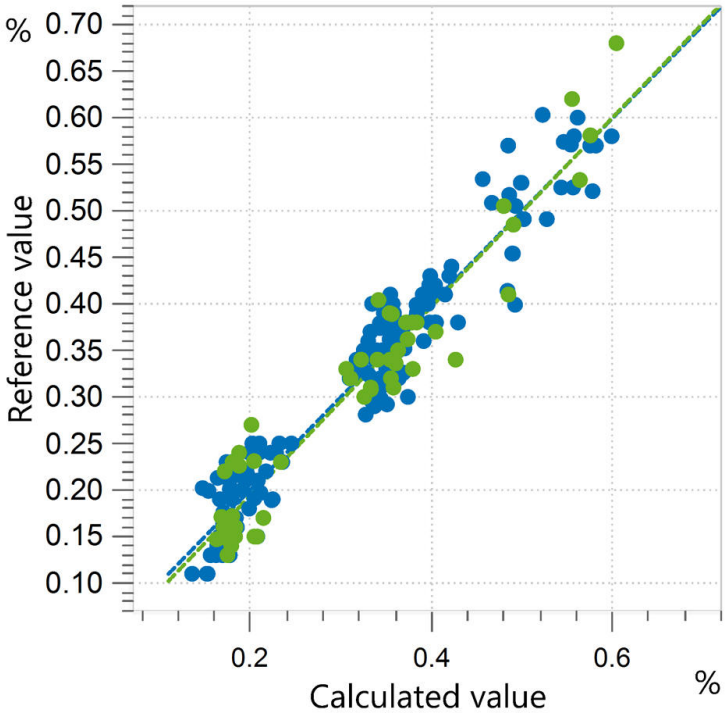


Figure 4. Correlation diagram and the respective figures of merit for the prediction of protein content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with the Kjeldahl method.

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

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CONFIGURATION



OMNIS NIR Analyzer Solid

用于固体物质和粘稠样品的近红外光谱仪。

OMNIS NIR Analyzer 按照瑞士质量标准开发和制造,是用于整个生产链中常规分析的近红外光谱 (NIRS) 解决方案。最新技术的应用以及与现代 OMNIS Software 的集成,体现在这款 NIR 光谱仪的速度、操作性和灵活应用上。

OMNIS NIR Analyzer Solid 的优势概览:

- 固体物质和粘稠样品测量时间小于 10 秒
- 自动多位置测量,确保即使在非均质样品中也能获得可重现的结果
- 可轻松集成至自动系统,或与其它分析技术(滴定)联用
- 支持多种样品容器



OMNIS NIR100 mm

适合大样品容器的大支架 OMNIS NIR,100 mm (6.07402.110)。

允许明确地定位样品容器和旋转样品容器。



OMNIS NIR100 mm

用于在不同样品位置处通过反射进行粉末和颗粒光谱记录的大样品容器。

玻璃底板由坚固耐用的 Gorilla® 玻璃制成。

兼容:

- 大支架 OMNIS NIR,100 mm (6.07402.100)

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允许单机版 OMNIS 软件在一台 WindowsTM 计算机上运行。

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- 须通过万通许可授权平台进行激活。

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A WHOLE NEW LEVEL OF PERFORMANCE

Quant Development

用于在独立 OMNIS Software 安装套件中编写和编辑量化模型的软件许可证。