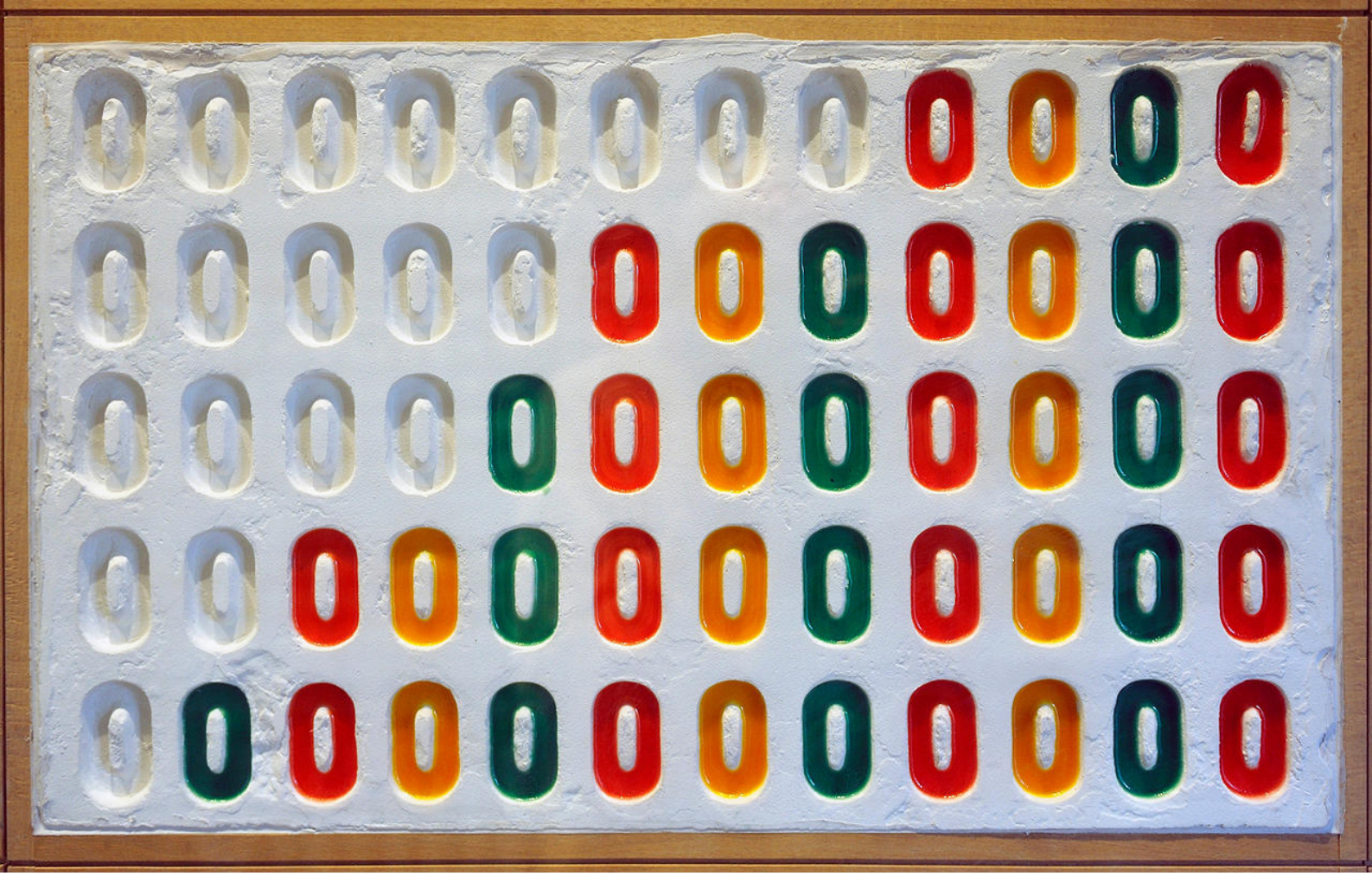


Application Note AN-NIR-151

# 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).

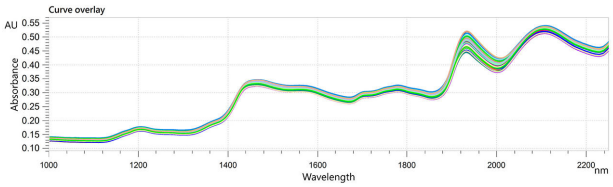



**Figure 2.** Selection of NIR spectra from starch samples measured in this study. Data was obtained with an OMNIS NIR Analyzer Solid.

## RESULT MOISTURE CONTENT IN CORN STARCH

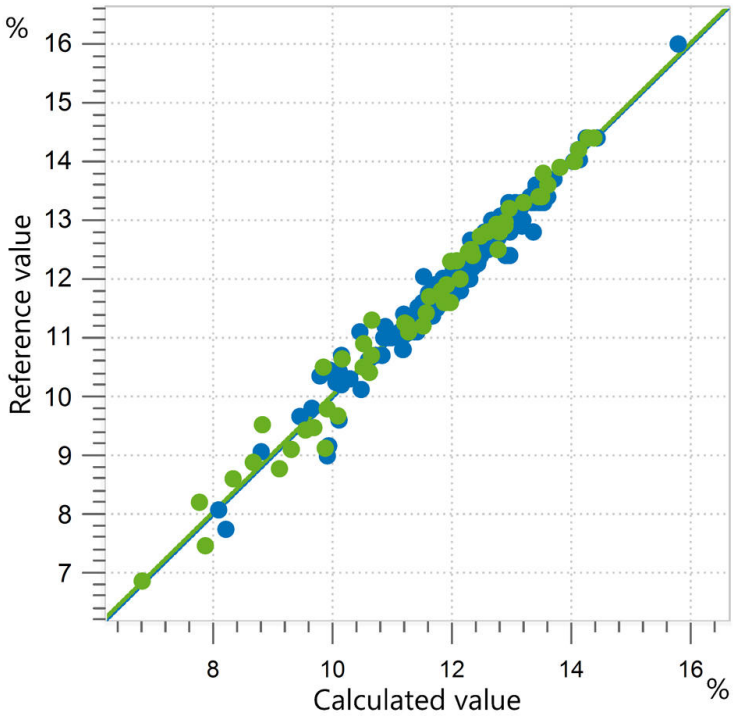



**Figure 3.** Correlation diagram and the respective figures of merit for the prediction of moisture content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with Karl Fischer titration.

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

## RESULT PROTEIN CONTENT IN CORN STARCH

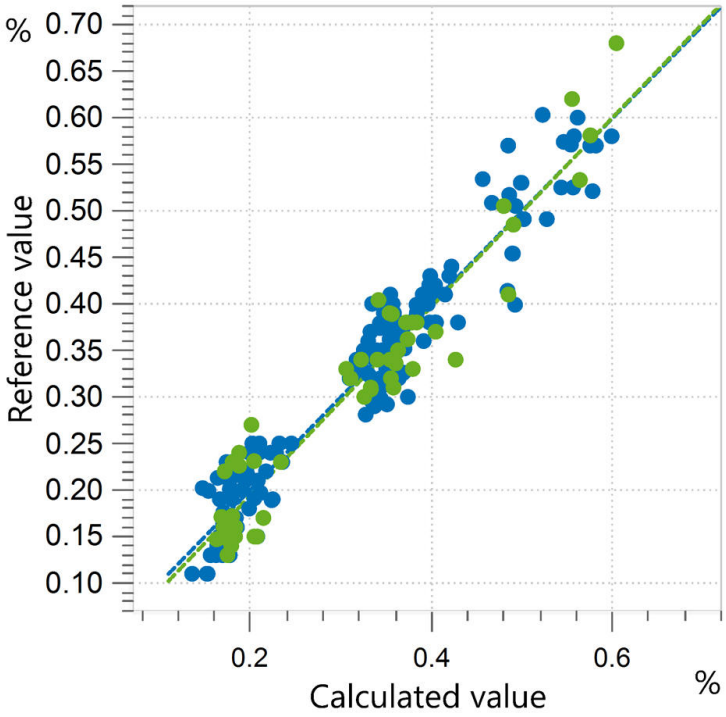



**Figure 4.** Correlation diagram and the respective figures of merit for the prediction of protein content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with the Kjeldahl method.

| $R^2$ | 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

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## CONFIGURATION



OMNIS NIR Analyzer Solid

**固形物および粘性のあるサンプル用の近赤外スペクトロメーター。**

スイスの品質規格に基づいて開発および製造された OMNIS NIR Analyzer は、生産工程全体にわたる日常的な分析に対応する近赤外分光法(NIRS)ソリューションです。最新技術の適用と、最新の OMNIS Software との統合により、この NIR スペクトロメーターは速度、操作性、そして柔軟な活用が可能となっています。

OMNIS NIR Analyzer Solid の利点の概要:

- 固形物および粘性サンプルの測定を 10 秒未満で実施
- 不均一なサンプルであっても再現性のある結果が得られる、自動多点測定
- オートメーションシステムへの容易な統合、または追加の分析技術 (滴定) との連携
- 多数のサンプル容器に対応



OMNIS NIR100 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.



### Grosse Schale OMNIS NIR, 100 mm

Grosses Probengefäss für die Spektrenaufnahme von Pulvern und Granulaten in Reflexion an unterschiedlichen Probenstellen. Der Glasboden besteht aus widerstandsfähigem Gorilla® Glass.

Kompatibel mit:

- Grossen Halter OMNIS NIR, 100 mm (6.07402.100)

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

### OMNIS

WindowsTMコンピューター上のOMNISソフトウェアをスタンドアローン操作することが可能になります。

特徴:

- ライセンスには、既に1つのOMNISデバイスライセンスが含まれています。
- メトローム・ライセンシングポータルにて、アクティブ化する必要があります。

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

### Quant Development

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