



## Application Note AN-NIR-106

# 利用近外光非性甜味行量控制

NIRS gives mixture analysis results within one minute

The use of non-nutritive sweeteners as sugar substitutes in foodstuffs has risen dramatically in the last decade, e.g., in soft drinks and snacks. Two examples are sucralose, a halogenated sucrose derivative, and Stevia, derived from the leaves of the *Stevia rebaudiana* plant. Both are much sweeter than sugar and are used in much lower concentrations in foodstuffs. To ensure food safety, regulations for non-nutritive sweeteners are becoming stricter. Several

analytical methods are available to determine various sweeteners using, e.g., high-performance liquid chromatography (HPLC), ion chromatography, and thin-layer chromatography. However, these methods are time-consuming and incur high running costs. Near-infrared spectroscopy (NIRS) allows the simultaneous determination of several sweeteners in less than one minute without any chemicals or sample preparation.

## EXPERIMENTAL EQUIPMENT

Mixtures of both Stevia (0.5–4.5%) and sucralose (0.5–4.5%) in sucrose (95%) were prepared and analyzed to create a prediction model for quantification.

Samples were measured with a Metrohm NIRS DS2500 Solid Analyzer (**Figure 1**) using 15 mm

disposable vials, a DS2500 holder, and a DS2500 Iris in reflection mode. The Metrohm software package Vision Air Complete was used for all data acquisition and prediction model development.

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

Equipment	Article number
DS2500 Solid Analyzer	2.922.0010
DS2500 Iris	6.7425.100
Disposable vials, 15 mm	6.7402.110
Vision Air 2.0 Complete	6.6072.208

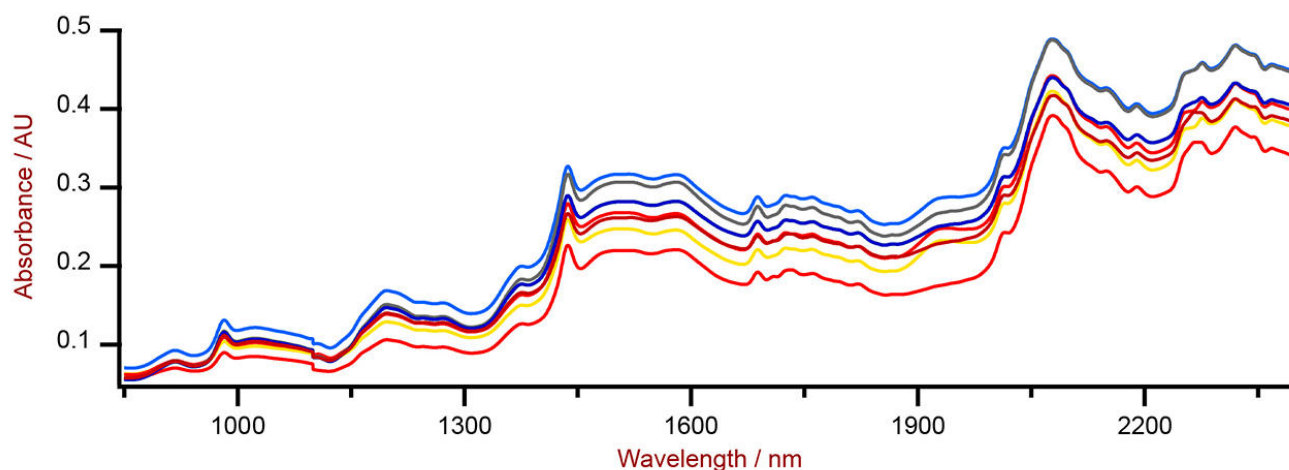


**Figure 1.** Metrohm NIRS DS2500 Solid Analyzer used to determine Stevia and sucralose content in sucrose mixtures.

## RESULT

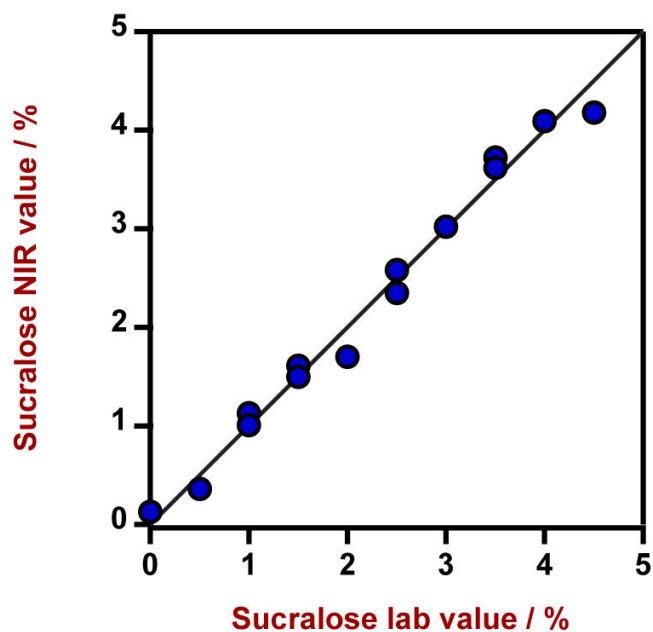
All measured Vis-NIR spectra (**Figure 2**) were used to create a prediction model for quantification of sucralose and Stevia in sucrose. The quality of the prediction models was evaluated using correlation diagrams which

display a very high correlation between the Vis-NIR prediction and the reference values. The respective figures of merit (FOM) display the expected precision of a prediction during routine analysis (**Figures 3–4**).



**Figure 2.** Selection of Vis-NIR spectra of Stevia and sucralose in sucrose samples which were analyzed on a DS2500 Solid Analyzer.

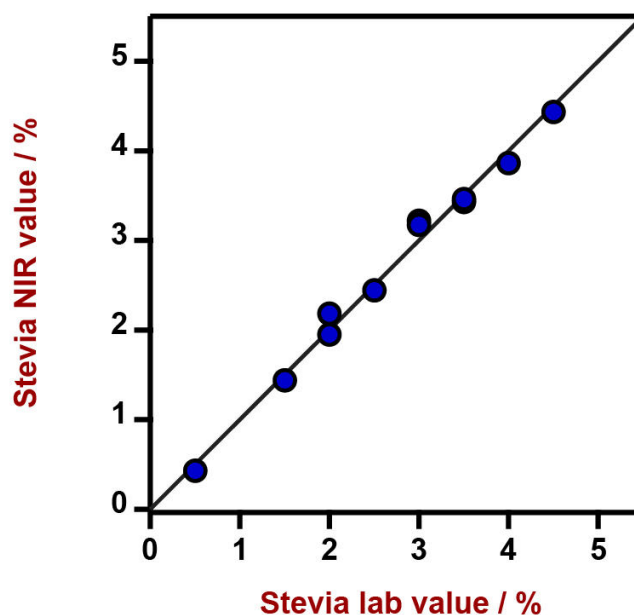
## RESULT SUCRALOSE CONTENT IN SUCROSE



**Figure 3.** Correlation diagram and the respective figures of merit for the prediction of sucralose content in sucrose using a DS2500 Solid Analyzer. The lab values were determined using HPLC.

Figures of Merit	Value
$R^2$	0.9854
Standard Error of Calibration	0.1898%
Standard Error of Cross-Validation	0.1997%

## RESULT STEVIA CONTENT IN SUCROSE



**Figure 4.** Correlation diagram and the respective figures of merit for the prediction of Stevia content in sucrose using a DS2500 Solid Analyzer. The lab values were determined using HPLC.

Figures of Merit	Value
$R^2$	0.9885
Standard Error of Calibration	0.1500%
Standard Error of Cross-Validation	0.1997%

## CONCLUSION

This Application Note demonstrates the feasibility to determine the concentration of the non-nutritive sweeteners sucralose and Stevia in sucrose blends with NIR spectroscopy. Vis-NIR

spectroscopy enables fast and cost-effective measurements with high accuracy, thereby offering a suitable alternative to other standard analytical methods (Table 2).

**Table 2.** Time to result overview for the different non-nutritive sweeteners examined in this study.

Parameter	Method	Time to result
Stevia	HPLC	~5 min (preparation) + ~40 min (HPLC)
Sucralose	HPLC	~5 min (preparation) + ~40 min (HPLC)

Internal reference: AW NIR AE10-0002-072021

## CONTACT

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## CONFIGURATION



### DS2500 Solid Analyzer

固的近外光,用于生境和室中的量。

DS2500 分析是的活解决方案,用于整个生程中的固体、乳膏和液体行常分析。其固的使 DS2500 Analyzer 分析不受灰、湿度、振和温度波的影,因此非常用于在劣的生境中使用。

DS2500 涵盖了从 400 到 2500 nm 的整个光范,并能在不到一分内提供准和可再的果。DS2500 Analyzer 足制行的要求,并由于操作便而能助用完成其日常工作任。

由于与匹配,附件可以承受任何具有挑性的品型,例如:粒料之的粗粒固体或乳膏之的半固体品,可得果。量固体的候,使用 MultiSample Cup 可以提高生率,可以自批量量多 9 个品。