



Application Note AN-NIR-079

肥料产品中的水分分析

Results in seconds with NIR Spectroscopy

Moisture content is one of the most commonly measured properties of fertilizers. Globally, regulations for different fertilizers vary, but local legal limits ensure that the maximum amount of water must not be exceeded. A number of analytical techniques are available for this purpose. Next to gravimetric methods, Karl Fischer titration is often used for accurate

moisture determination.

Compared to these methods, near-infrared spectroscopy (NIRS) offers unique advantages: it generates reliable results within seconds, and at the same time does not create chemical waste. This Application Note explains how NIRS can offer fast, reagent-free analysis of moisture content in various fertilizer products.

EXPERIMENTAL CONDITIONS

Different fertilizer product types with varying moisture content from 0.12% to 3.82% were measured using a Metrohm DS2500 Solid Analyzer. To overcome sample inhomogeneity, the measurement was performed with a large sample cup in rotation. Data collection and model development was carried out with the Vision Air complete package. Reference values were obtained by coulometric KF-titration coupled with KF oven. The NIRS prediction model was created with the settings described in the following table and validated using a cross validation algorithm.



Figure 1. The DS2500 Solid Analyzer was used to collect the spectra of fertilizer samples.

Pre-Processing	Algorithm	Validation Type
2 nd derivative	PLS	Cross validation

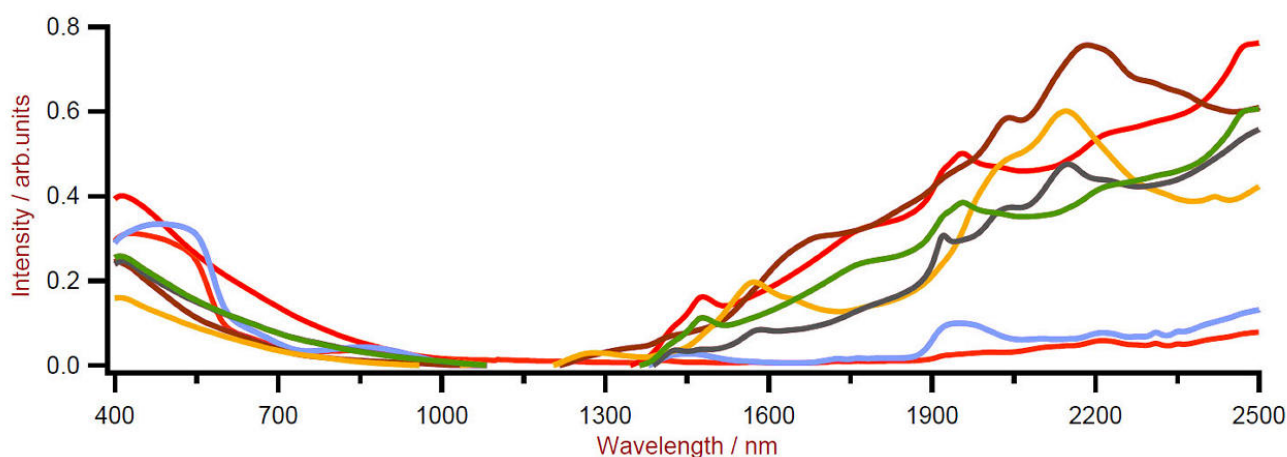


Figure 2. Raw spectra of different fertilizer products with varying water content.

RESULT & CONCLUSION

The obtained graph displays a high correlation ($R^2 = 0.98$) between moisture predicted by the NIRS model and the KF-titration method. Although different fertilizer types were used to

create the prediction model, a close ratio between SEC and SECV values proves the validity of the model.

# Factors	R ²	SEC	SECV
3	0.98	0.29%	0.32%

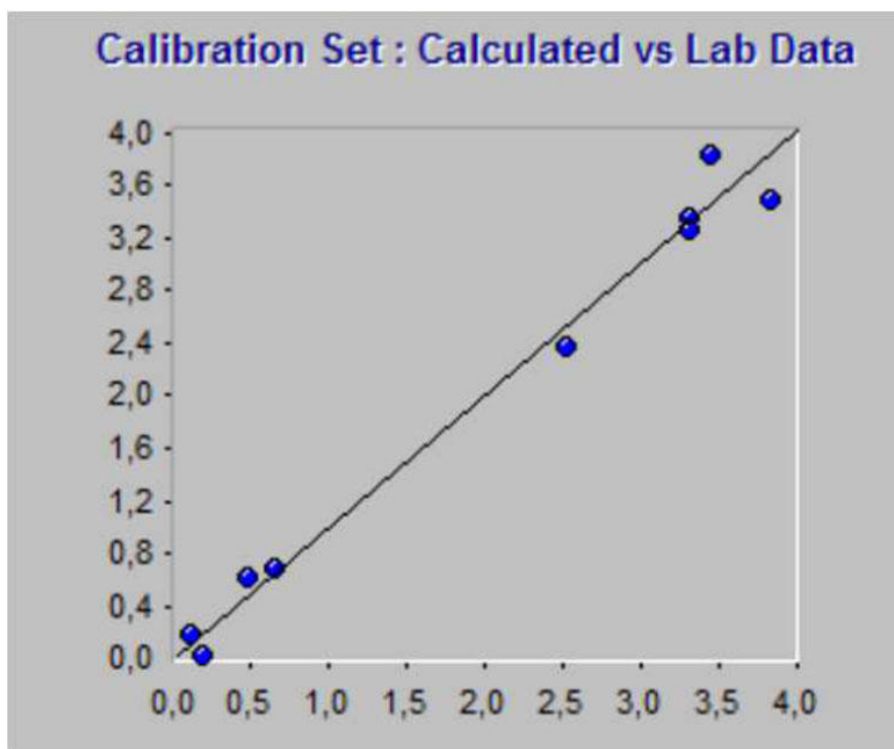


Figure 3. Correlation graph for moisture predicted by NIRS vs titration.

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CONFIGURATION



DS2500 Solid Analyzer

坚固结实的近红外光谱仪,用于生产环境和试验室中的质量检查。

DS2500 分析仪是经过验证的灵活解决方案,用于对整个生产链过程中的固体、乳膏和液体进行常规分析。其坚固结实的设计使 DS2500 Analyzer 分析仪不受灰尘、湿度、振动和温度波动的影响,因此非常适用于在恶劣的生产环境中使用。

DS2500 涵盖了从 400 到 2500 nm 的整个光谱范围,并能在不到一分钟时间内提供准确和可再现的结果。DS2500 Analyzer 满足制药行业的要求,并由于操作简便而能帮助用户完成其日常工作任务。

由于与设备匹配,附件可以承受任何具有挑战性的样品类型,例如:粒料之类的粗颗粒固体或乳膏之类的半固体样品,可获得结果。测量固体的时候,使用 MultiSample Cup 可以提高生产率,可以自动批量测量多 9 个样品。



Vision Air 2.0 Complete

Vision Air – 通用的光谱分析软件。

Vision Air Complete 是用于监管规范环境的先进易用的软件解决方案。

Vision Air 优点一览:

- 便捷的软件应用和经过适配的用户界面保证了直观简单的操作方式
- 操作过程的创建与维护方式简单
- SQL 数据库,可安全且简单地管理数据

Vision Air Complete (66072208) 版本包含所有用于可见近红外光谱分析质量保证过程的应用:

- 仪器和数据管理应用
- 方法开发应用
- 常规分析应用

其它 Vision Air Complete 解决方案:

- 66072207 (Vision Air Network Complete)
- 66072209 (Vision Air Pharma Complete)
- 66072210 (Vision Air Pharma Network Complete)



DS2500

用于在不同样品位置处使用 NIRS DS2500 Analyzer 采集粉末和颗粒反射光谱的大号样品容器。