



Application Note AN-NIR-079

# Moisture analysis in fertilizer products

## 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.

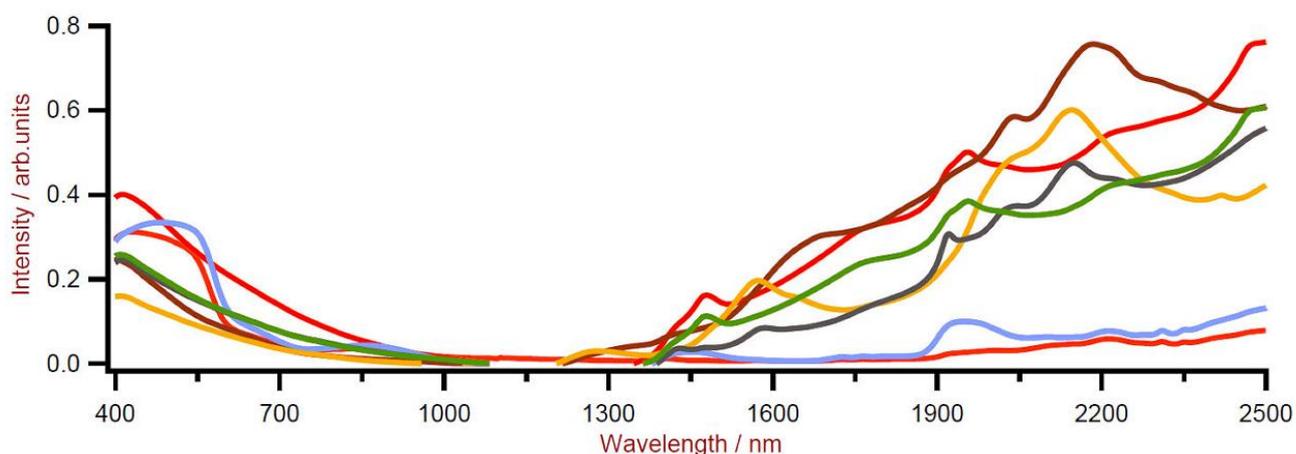
## EXPERIMENTAL CONDITIONS

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 <sup>nd</sup> derivative	PLS	Cross validation



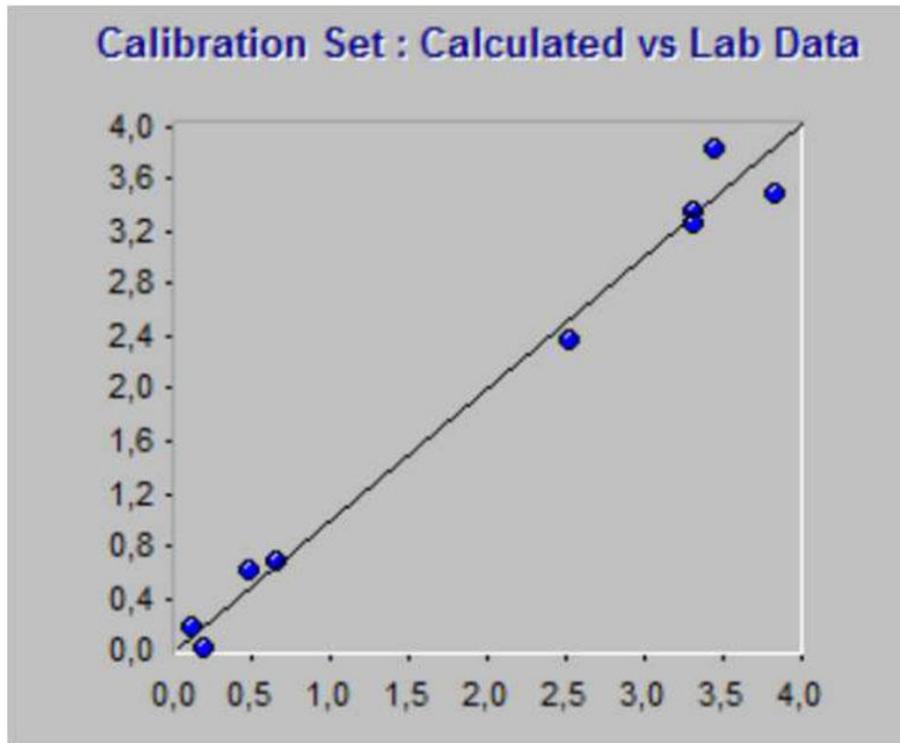
**Figure 2.** Raw spectra of different fertilizer products with varying water content.

## 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 <sup>2</sup>	SEC	SECV
3	0.98	0.29%	0.32%



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

## CONTACT

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## CONFIGURATION



### DS2500 Solid Analyzer

**坚固耐用的近外光,用于生境和室中的量。**

DS2500 分析是活的解决方案,用于整个生程中的固体、乳膏和液体行常分析。其坚固耐用的使 DS2500 Analyzer 分析不受灰、湿度、振和温度波影,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。

由于与完美匹配,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,可得最佳果。量固体的候,使用 MultiSample Cup 可以提高生率,可以自批量量最多 9 个品。



### Vision Air 2.0 Complete

**Vision Air – 通用的光分析件。**

Vision Air Complete 是用于管范境的先易用的件解决方案。

Vision Air 点一:

- 独特的件用和配的用界面保了直的操作方式
- 操作程的建与方式
- SQL 数据,可安全且地管理数据

Vision Air Complete (66072208) 版本包含所有用于可近外光分析量保程的用:

- 器和数据管理用
- 方法用
- 常分析用

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

用于在不同品位置使用 NIRS DS2500 Analyzer 采集粉末和粒反射光的大号品容器。