

# Water Content Analysis



Karl Fischer titration and Near-Infrared Spectroscopy  
in perfect synergy

# Karl Fischer titration in the lab - Near infrared spectroscopy in the process

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**Metrohm offers the unique combination of high-precision laboratory analysis and inline spectroscopic analysis methods. This results in a powerful duo for water determination in low concentrations directly in your process, to improve product quality and increase savings.**

## Innovation know-how for over 50 years

Metrohm relies on many years of know-how in the areas of Karl Fischer (KF) titration and is recognized as the global market leader in this field. Karl Fischer titration is one of the most widely used analytical methods in routine laboratory work and it provides precise analytical results for samples collected in the process. To increase sample throughput, productivity, and product quality; water determination can be easily implemented inline, in the process, thanks to NIR spectroscopy. The results of the laboratory analysis are directly used to create the prediction model for the NIR spectrometer.

## Safe and economical process control

Near-infrared spectroscopy (NIRS) is ideal for continuous process monitoring. Without sampling or using chemicals, analytical results are generated in near real-time every second. The measurement itself takes place directly in the process line and the precision of the method (NIR) is always as good as its reference analysis (KF). This is exactly where Metrohm brings added value and a high level of confidence, thanks to an unprecedented expertise on the lab analysis and the process implementation.

## The benefits for NIR spectroscopy in process



### Efficiency

- Reliable inline quality control
- Optimized process control through «real-time» analysis
- Up to 9 independent sampling points with one instrument



### Quality

- Accurate and precise analysis method
- Minimize human error
- Early process deviations detection



### Costs

- Shorter production times
- Higher yields, less rework
- Low-maintenance analytics
- Higher product quality
- No reagent - No chemical waste
- Save on man hours



### Time

- No sample preparations
- Fast analysis results around the clock (24/7)
- Fast ROI, in most cases < 3 months



### • Reliability

Robust process analyzers for in plant operation in hazardous environments with high uptimes

### • Added benefit

Multiplexing capability of NIR systems: More savings per measurement point and results

### • Synergy

Optimum inline application creation by using high-precision Karl Fischer titration as validation method

### • Sustainability

Less use of utilities (steam, electricity,...) thanks to better process control. Less chemical waste thanks to the reduction of chemical use and sample volume in the laboratory

# Near-infrared spectroscopy from Metrohm - Pushing the limits together

## The method of choice

The NIRS XDS Process Analyzers from Metrohm transfer the determination of water content directly into the process. The method does not replace laboratory analysis - it complements it to the extent that a continuous monitoring of the process is enabled. Therefore, the number of intermediate controls with Karl Fischer titration can be reduced.

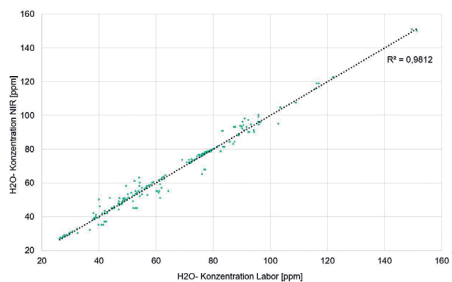
## Accurate analysis results

Only the high precision and availability of laboratory analysis and the support of Metrohm application specialists make NIRS measurement possible even in the low concentration range of less than 10 mg/L (ppm). The deciding factor here is the optimal method creation.

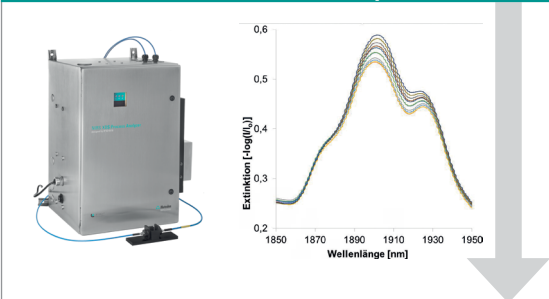
### KF titrator - The primary analysis in the lab



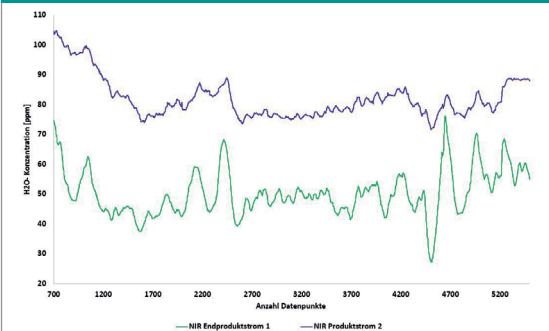
### Developing method



### NIR routine measurement in the process



### Reliable analysis results make your QA and QC more efficient and safer



### • Customized applications

In routine laboratory work, the Karl Fischer titrator generates a multitude of results from samples collected in the process. Meanwhile, spectra of those samples are recorded (offline or directly in the process) with the NIRS XDS Process Analyzer.

### • Linking of Laboratory and Process analytics

To determine the water concentration, a robust calibration model is created. The spectra are now linked to the results of the primary analysis in the analysis software. This creates a linear relationship between laboratory and NIR values. The developed method is now ready for the process.

### • Real-time analytics in the process

Using optical fibers and immersion probes, the analyzer is connected to one or up to nine measuring points simultaneously in the process. The prediction model is applied to each individual continuously recorded spectra and the analysis results are displayed in seconds.

### • Fully automated solution for your process

A true added value for your process. The NIRS XDS Process Analyzer provides reliable water analysis results 24 hours a day, 365 days a year, directly to your PC or DCS. In addition, warning limits or intervention limits can be defined by the user.

[www.metrohm.com](http://www.metrohm.com)