INTERVIEW

Polymer & Polyol Analysis

Fast and reliable with NIR Spectroscopy

The Metrohm near-infrared XDS RapidLiquid Analyzer is proven to be a valuable instrument for easy and reliable quality control of both the starting materials and intermediate products of polyols and polymers. Hydroxyl value, NCO, moisture, TBHP, and polymerization inhibitor (TBC) content are just a few parameters, which can be quantified in less than a minute without any sample preparation required.

Guo Yuanfeng from the Wanhua Chemical Group Co, Ltd. in Yantai (China) is a technical engineer responsible for the implementation and verification of analysis methods. He uses the Metrohm NIRS XDS RapidLiquid Analyzer at his job and has agreed to share his experience (transcribed from Chinese).

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MR. GUO YUANFENG, CAN YOU PLEASE BRIEFLY DESCRIBE THE LAB YOU ARE WORKING AT?

The quality inspection center of Wanhua Chemical Group Co., Ltd. located in the Yantai production complex has four QC laboratories: MDI quality inspection, petrochemical quality inspection, ethylene quality inspection, and an online analysis center. These laboratories are mainly responsible for the analysis of incoming raw materials, as well as intermediates and finished products. Wanhua Chemical Group Co. takes quality control seriously and uses more than 110 different types of analysis instruments, with a total count of more than 1300 individual analyzer.

WHAT IS YOUR ROLE WITHIN THE QC LABORATORY / QC LABORATORIES?

As a technical engineer, I am mainly responsible for the implementation and verification of analysis methods and compiling instrument operation procedures. I review quality control results and solve technical problems in the daily inspection process. I take corrective actions and formulate preventive actions for non-conformant tests. Furthermore, I organize the implementation of annual quality controls of the laboratory and participate in the performance verification among the different QC laboratories.

WHICH ANALYSES ARE CONDUCTED IN YOUR LABORATORIES?

The laboratory verifies product purity and hydrocarbon composition. The main parameters analyzed by the laboratories are inert gas, polymerization inhibitors, moisture, hydroxyl value, total sulfur, total chlorine, acid value, metal ions, NCO content, COD, TOC. The results help us to judge whether the raw materials, intermediates, and end products meet our requirements.

A short introduction into NIRS

A NIR absorption spectrometer measures the interaction between light and matter and generates spectra. The spectra can be used to quantify key quality parameters.

LEARN MORE HERE!

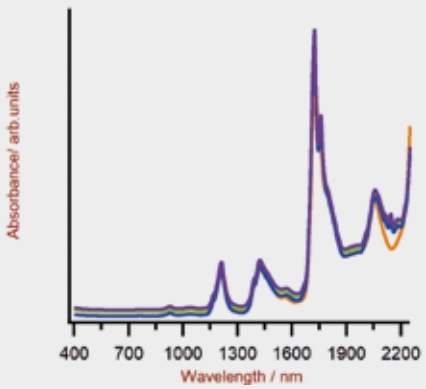


Figure 1. Spectra of polyols resulting from the interaction of NIR light with the respective samples.

WHY DID YOU CONSIDER NEAR-INFRARED SPECTROSCOPY (NIRS) FOR YOUR LABORATORIES?

We use NIRS for the analysis of several parameters including hydroxyl value, moisture, TBHP, polymerization inhibitor (TBC), mixed acids, and other constituents in the raw materials and for the overall control of our production lines. There are some disadvantages to using traditional analytical methods, such as the use of highly toxic reagents, long analysis times, and low utilization of the instruments. Near-infrared spectroscopy has several advantages over these traditional wet-chemical techniques:

1) No sample preparation is required.
2) NIRS is a non-destructive analytical technique.
3) No chemicals are required. During the analysis process there is no contact with toxic and harmful reagents and no waste is generated—thus it is a green and environmentally friendly technique.
4) Fast multiparameter analysis with time to result of less than one minute, which is simple and fast. Routine analysis is also possible by non-specialists.
5) The NIRS Analyzer does not need frequent maintenance and has low consumable costs.

WHAT WERE THE CHALLENGES YOU HAD TO OVERCOME WHEN IMPLEMENTING THE NIRS METHOD?

Samples with frequent changes in their composition and some dispersed solid samples are challenging to analyze. We had to collect many samples to create robust NIRS methods, which took a long time. Furthermore, we came to realize that NIRS is not suitable for trace analysis because of the detection limit. As it is a secondary technology, we also implemented procedures to regularly check the NIRS prediction model with primary lab methods.

Pre-calibrations: Ready to use analyzers for polymer and polyol analysis.

The DS2500 Polymer Analyzer and the DS2500 Polyol Analyzer are pre-calibrated and ready to use systems for many parameters. Find more information, which parameters are covered here:

DS2500 POLYMER ANALYZER and **DS2500 POLYOL ANALYZER**

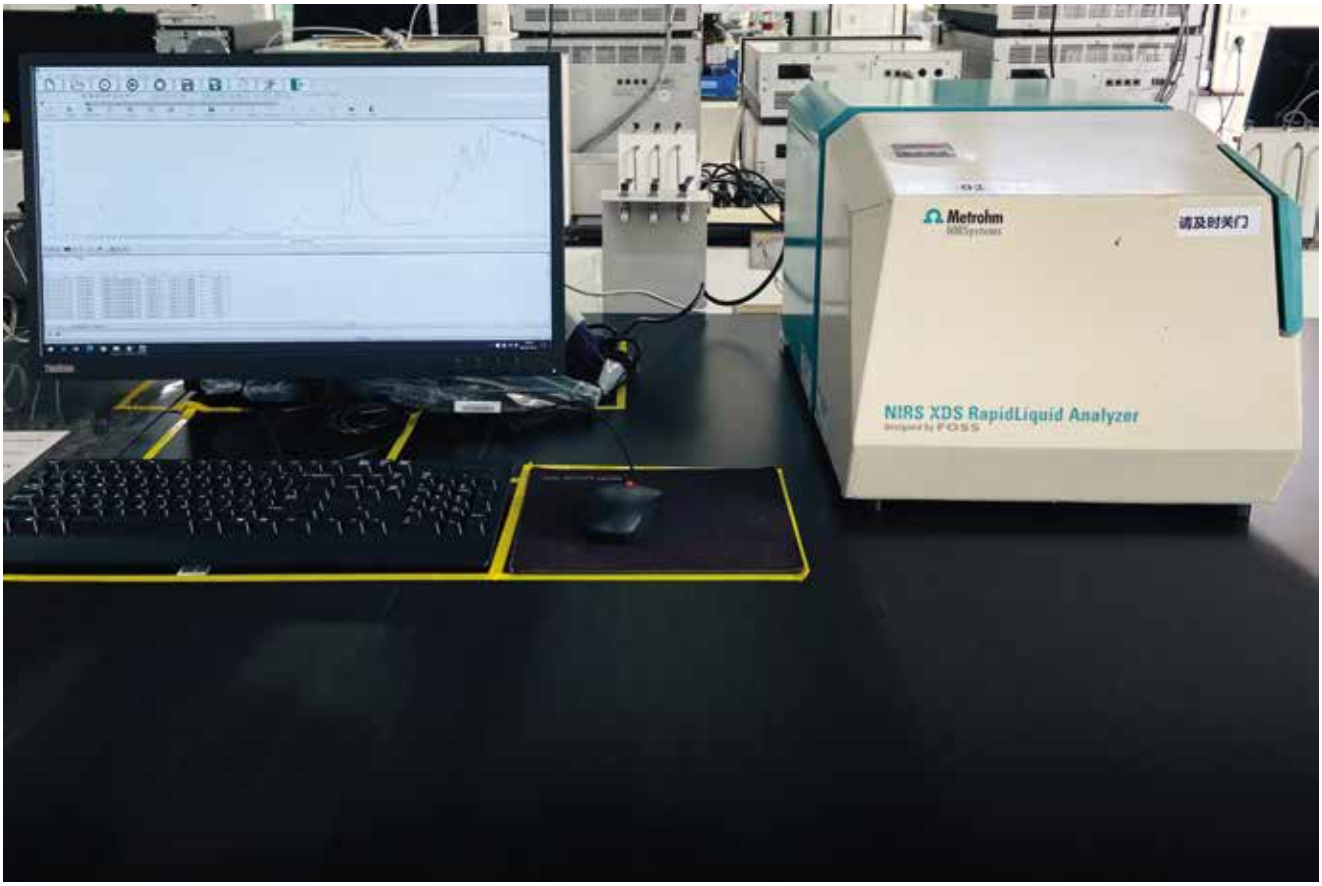
Figure 2 Pre-calibrated DS2500 Polymer Analyzer and DS2500 Polyol Analyzer.

WHY DID YOU CHOOSE METROHM AS A SUPPLIER FOR A NEAR-INFRARED ANALYZER?

Metrohm has provided our company not only with high-quality products and excellent solutions, but also the best after-sale services. Metrohm is a reliable and high-quality instrument supplier. The Metrohm instruments have been used in our Wanhua laboratories for nearly 10 years with excellent performance and low failure rates. Compared with other instrument suppliers, Metrohm products are simple to operate with low maintenance costs. The NIRS XDS RapidLiquid Analyzer that we use in Wanhua has an advanced design, good reproducibility, and is suitable for a wide range of applications.

WHERE DO YOU USE THE NIRS ANALYZER IN YOUR LAB(S)?

For petrochemical samples, NIRS is mainly used for the analysis of hydroxyl value, moisture, TBHP, and polymerization inhibitor (TBC) content. For amine and polyurethane samples, NIRS is mainly used for the analysis of moisture, NCO content, mixed acids, color index, and viscosity.



PRODUCT CONFIGURATOR ARTICLE NUMBERS WITH DS2500 LIQUID ANALYZER (REPLACEMENT OF XDS RAPIDLIQUID ANALYZER):

Instrument	
2.929.0010	DS2500 Liquid Analyzer
6.7492.020	DS2500 Holder 8 mm vials
6.7402.240	Disposable vials, 8 mm diameter, transmission
6.6072.201	Vision Air 2.0
6.6072.301	Pre-calibration for the analysis of polyols
6.6072.312	Pre-calibration for the analysis of isocyanate