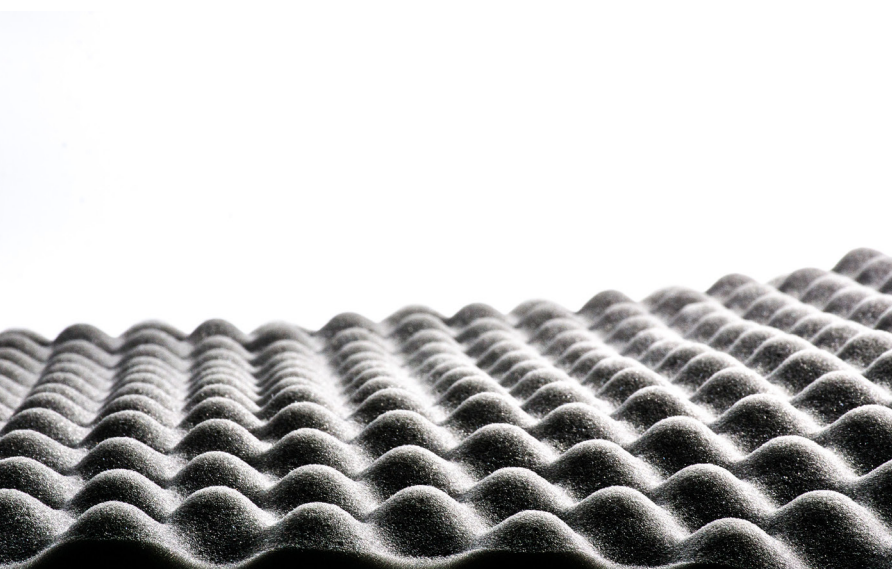


Determination of NCO% in polyurethane polymers using FT-NIR spectroscopy



FT-NIR spectroscopy performs a fast and non-destructive determination of NCO% in polyurethanes.

Measurement made easy

01

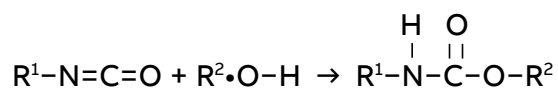
01 Polyurethane foam

02 Polyurethane polymerization reaction

Overview

Polyurethane polymers are used in the manufacture of foams, inks, adhesives, synthetic fibers, and plastics.

Polyurethane polymers are traditionally, and most commonly formed by reacting an isocyanate with a polyol. The progress of the reaction can be followed by measuring the NCO%.



02

Application details

FT-NIR is an attractive alternative as it allows to perform rapid determination of NCO% in polyurethanes in a fast and non-destructive manner. Each sample can be analyzed within a minute, and the test can be performed by an operator without analytical background. The FT-NIR technique will typically exhibit a reproducibility similar to traditional laboratory methods, but with much better repeatability and robustness.

In this study, we illustrated the use of an ABB FT-NIR instrument (PTPA2000-260) for fast determination of NCO% in polyurethane polymer.

01 Calibration NCO% plots: actual vs predicted

02 Calibration results

03 FTPA2000-260 analyzer

Method

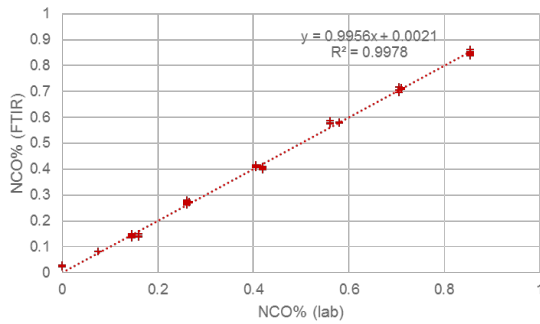
- Instrument: FTPA2000-260
- Detector: InGaAs, 2.6 µm TEC
- Sampling technique: transreflectance probe
- Path length: 10 mm
- Analysis temperature: 65 to 70 °C (149 to 158 °F)
- Resolution: 16 cm⁻¹
- Number of scans: 128
- Chemometrics model: Partial Least Squares (PLS)

Conclusion

Based on the work performed by ABB, it has been demonstrated that online monitoring of NCO% by NIR is feasible.

The study was done using a transreflectance probe. However, for an industrial use, a transmission probe or a flow through cell should be considered for more repeatability and an easier cleaning process.

Results



03

01

Property	Range (%)	R ²	SECV (%)
NCO%	0 to 0.86	0.998	0.012

02

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