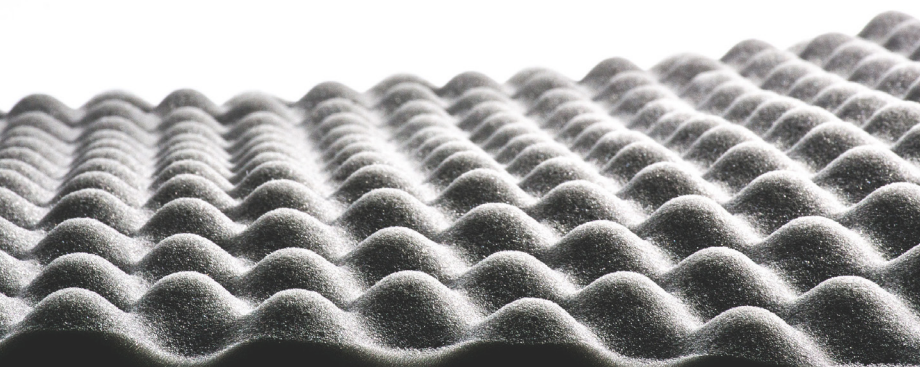


Using FT-NIR spectroscopy to determine isocyanate content in polyurethane polymers

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

Measurement made easy.

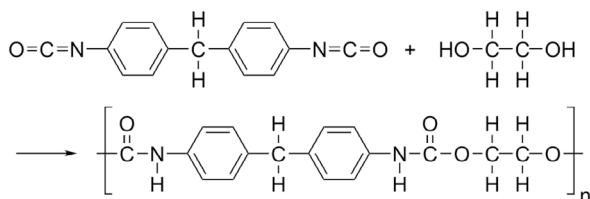


- 01 Polyurethane foam
- 02 Polyurethane polymerization reaction

Overview

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

Traditionally, polyurethane polymers are most commonly formed by reacting an isocyanate (characterized by functional group NCO) with a polyol. The progress of the reaction can be followed by measuring the evolution of isocyanate content (NCO%).



Application details

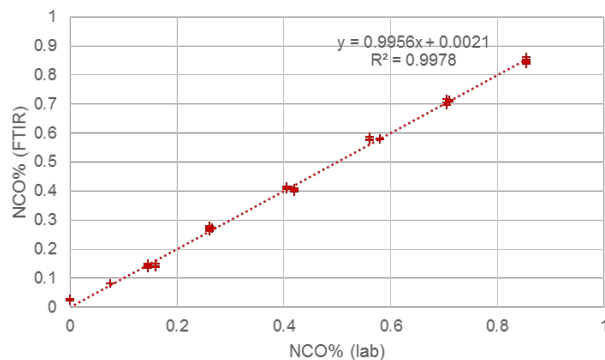
FT-NIR is an attractive alternative because it helps the rapid determination of NCO% in polyurethanes in a fast and non-destructive manner. Each sample can be analyzed within one minute and the test can be performed by an operator with no analytical background. The FT-NIR technique's reproducibility is typically 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 (FTPA2000-260CH) for fast determination of NCO% in polyurethane polymer.

—
 01 Calibration NCO%
 plots: actual vs predicted
 —
 02 Calibration results
 —
 03 FTPA2000-260CH
 analyzer

Method

- Instrument: FTPA2000-260CH
- Detector: InGaAs, 2.6 μm TEC
- Sampling technique: transfectance probe
- Pathlength: 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)



—
 01

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

—
 02

Conclusion

ABB's work has demonstrated that online monitoring of NCO% by FT-NIR is feasible.

The study was done using a transfectance probe. However, for industrial use, a transmission probe or a flowthrough cell can be used to facilitate the cleaning process.



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 03

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