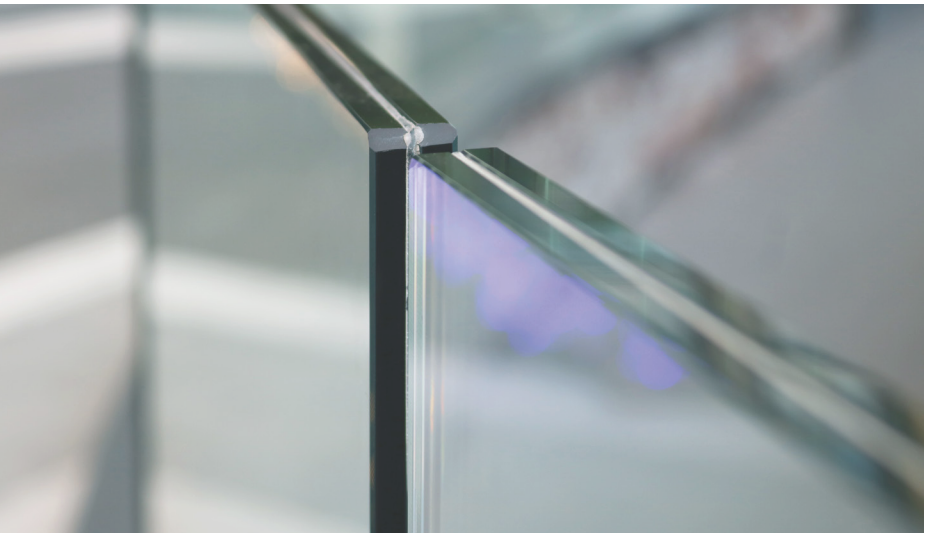
ABB MEASUREMENT & ANALYTICS | APPLICATION NOTES

Plasticizer analysis in PVB film using FT-NIR



FT-NIR spectroscopy provides reliable and fast quantification of the plasticizer concentration in PVB film manufacturing.

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01 ABB MB3600 FT-NIR laboratory analyzer

Overview

Polyvinyl Butyral (PVB) is an optically clear film that is thermically resistant, flexible, exhibits a strong adhesion to many surfaces and possesses high mechanical strength. PVB is an excellent interlayer material used in manufacturing laminated safety glass for the automotive industry and photovoltaic applications.

The addition of plasticizers allows the PVB powder to be transformed into a film through a melt-mixing process. The quality and properties of the film vary depending on the ratio between the amount of added plasticizer and PVB powder. For example, a higher content of plasticizer produces a PVB film with reduced tensile strength and glass transition temperature, but with increased elongation at the break and melt flow rate.

One of the most common techniques used to quantify the amount of plasticizer added to a PVB film sample is measuring the weight loss rate during high temperature decomposition through thermogravimetric analysis (TGA). This technique is time consuming, where typical measurement can take more than 30 minutes, while also consuming nitrogen gas. Alternatively, use of an at-line FT-NIR analyzer could enable fast, reliable, accurate and non-destructive measurement of the plasticizer concen-tration for quality control in PVB film manufacturing.

Method

Instrument: MB3600 FT-NIR Laboratory Analyzer
Detector: InGaAs 2.6 µm thermoelectrically cooled
Sampling technique: transmission with 20 mm PIKE universal sample holder
Analysis temperature: room temperature
Resolution: 16 cm^{-1}
Number of scans: 128
Acquisition time: less than a minute

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01 20 mm PIKE universal sample holder with PVB film installed in the sampling compartment of an MB3600 FT-NIR laboratory analyzer
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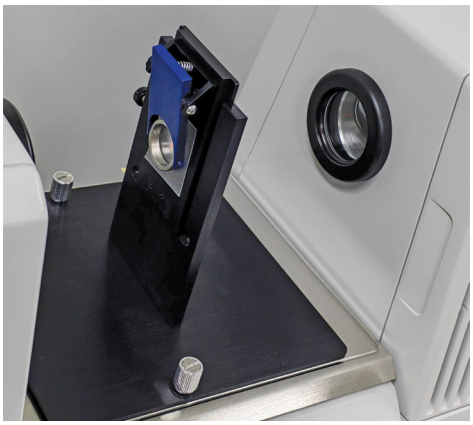
02 Calibration curve for plasticizer % concentration in PVB film



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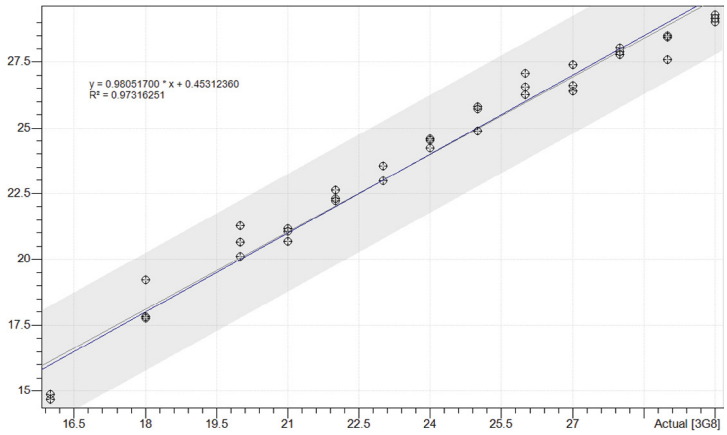

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Calibration results

Property	Range (%)	r^2	SECV (%)
Plasticizer concentration	16-30	0.9732	0.6928

Conclusion

Using the FT-NIR technique to measure the plasticizer content of PVB film aligns well with the reference values. This study demonstrates that FT-NIR spectroscopy can be successfully and reliably used for fast quantification of the plasticizer concentration in PVB film manufacturing.

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