ABB MEASUREMENT & ANALYTICS | APPLICATION NOTE

Quantitative analysis of acid value, OH value and viscosity in acrylic acid esters using FT-NIR spectroscopy

FT-NIR technology provides a quicker, cheaper and simpler alternative for QA/QC product lot certification and release.

Measurement made easy

01 Wood coating

Overview

Acrylic acid esters are formed by the reaction of acrylic acid with alcohols. They are typically used as reactive monomers in energy curable coatings, inks and varnishes.

Hydroxyl value (OHv), acid value (Av) and viscosity (Visco) are commonly used to characterize and certify final acrylic acid ester products. OHv and Av provide an indication on synthesis completion, while Visco allows estimation of the molar mass of the produced monomers.

Wet-chemical conventional laboratory reference methods for acrylic acid esters are tedious, time-consuming and expensive.

The objective of this study is to perform the quantitative analysis of acrylic acid esters by FT-NIR spectroscopy by evaluating the OHv, Av and Visco.

Application details

Method

- Instrument: MB3600
- Detector: DTGS
- Sampling technique: 8 mm disposable glass
- Analysis temperature: 30 °C (86 °F)
- Resolution: 16 cm^{-1}
- Number of scans: 128
- Spectral region: 4800 to 9250 cm^{-1}

Results

Property	Range	R^2	SECV	SEP
Av (mg KOH/g)	0.01 to 0.294	0.679	0.042 (5F)	0.036
OHv (mg KOH/g)	5.7 to 47.7	0.953	2.42 (5F)	0.82
Low Visco (mPas)	6.4 to 15	0.986	0.37 (2F)	0.12
High Visco (mPas)	6.4 to 120.3	0.989	4.5 (5F)	8.2

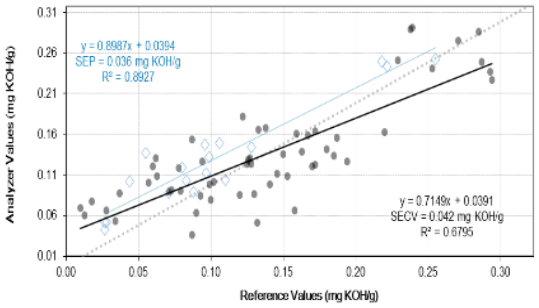
01 Av plot
(actual vs predicted)

02 OHv plot
(actual vs predicted)

03 Low Visco plot
(actual vs predicted)

04 High Visco plot
(actual vs predicted)

05 MB3600 spectrometer used with the ABB universal vial holder



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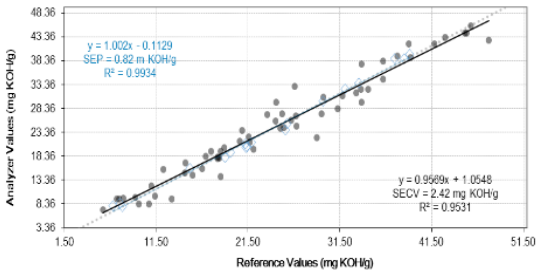

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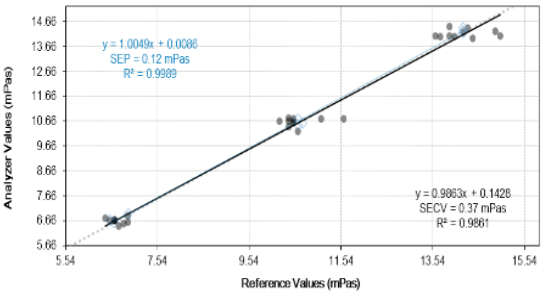

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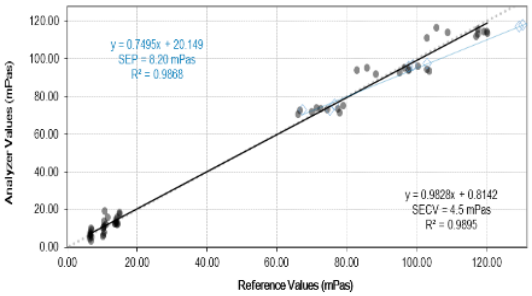

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Key benefits

- Fast results (less than 1 minute)
- Multi-component analysis on a single sample
- Replaces slow ‘wet chemical’ methods
- Enables determination of chemical and physical properties
- No consumables, solvents, or reagents needed
- Low cost per analysis

Conclusion

The results of this study demonstrate that FT-NIR spectroscopy can be used successfully to determine OHv, Av and Visco in acrylic acid esters. This methodology requires no sample preparation thus providing a quicker, cheaper and simpler alternative for QA/QC product lots certification and release.

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