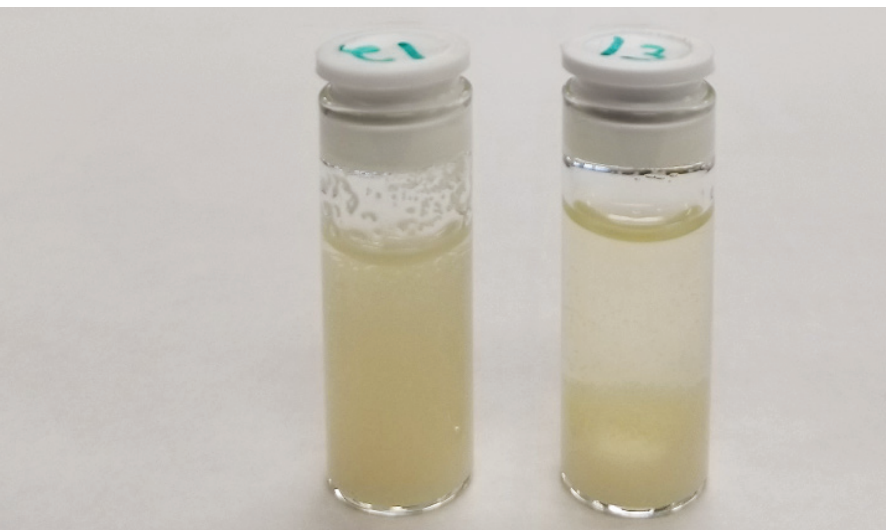


Quantitative analysis of citric acid



FT-NIR spectroscopy provides a quicker, cheaper and simpler alternative for reaction monitoring.

Measurement made easy

01

01 Unfiltered
Sample from Citric
Acid Fermentation
Industrial Process

02 Citric acid formula

Overview

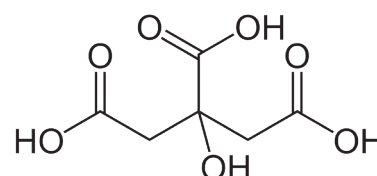
Citric acid is an important organic acid used extensively in the food and pharmaceutical industries. It is produced mainly by submerged fermentation.

The progress of the reaction can be followed by pH titration. Wet-chemical conventional laboratory reference methods for titration are tedious and time consuming.

The objective of the feasibility study was to demonstrate the use of FT-NIR spectroscopy to quantify citric acid in a process sample.

Method

Instrument: MB3600
 Detector: InAs
 Sampling technique: Vial holder 12 mm
 Analysis temperature: 30 °C
 Resolution: 16 cm⁻¹
 Number of scans: 128
 Chemometrics model: Partial Least Squares (PLS)



02

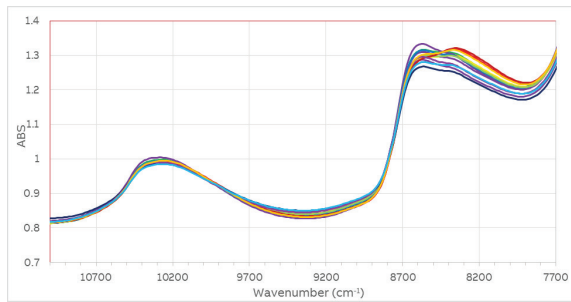
01 Spectra of samples from fermentation process, unfiltered, at different concentrations in citric acid with a baseline correction.

02 Actual Citric Acid Concentration vs Predicted plot

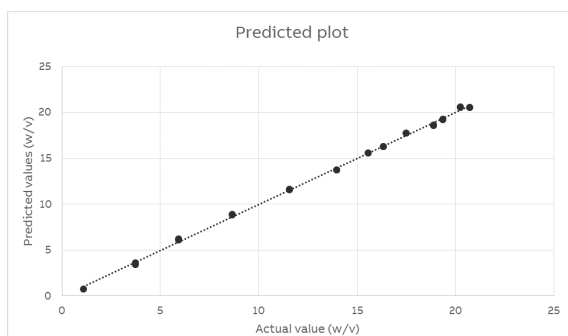
03 Calibration results

04 MB3600 FT-NIR analyzer

Results



01



02

Property	Range (w/v)	R ²	SEVC (%)
C ₆ H ₈ O ₇	1.1 to 20.7	0.9988	0.2123

03

Conclusion

The results of this study demonstrate that FT-NIR spectroscopy can be used successfully to determine concentrations of citric acid in an inhomogeneous solution of fermentation with a laboratory off-line procedure. It provides a quicker, cheaper and simpler alternative for reaction monitoring.

This methodology requires no sample preparation. The presence or the absence of particles causes the baseline to shift uniformly over the range of wavenumbers which is thus easily corrected by a standard baseline correction. There are not significant differences between results from the turbid samples and limpid ones.

ABB recommends using an FTPA2000-260 or TALYS analyzer equipped with 1.7 μm InGaAs detectors for on-line implementations. The sampling interface requires an ACC115 cell (15 mm pathlength) and valves to lock the sample during measurement, thus avoiding interferences caused by particle movement.



04

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