Process Insights™
Premium Insights Into Process

REAL-TIME OPTICAL ABSORPTION ANALYZERS

APPLICATION NOTE

Water in Aromatic/Acetone Mixtures with a ClearView db Photometer

Objective

Measure water to better than ±0.01% (wt.) in an aromatic liquid mixture with a ClearView® db photometer.

Experimental

Samples were measured in a 5 mm cuvette heated to 47 °C. Spectra was then collected of the samples using a LAB NIR-O™ spectrometer. Water concentrations were determined by KF titration. Samples contain isopropyl benzene, acetone and phenol in approximately constant ratios.

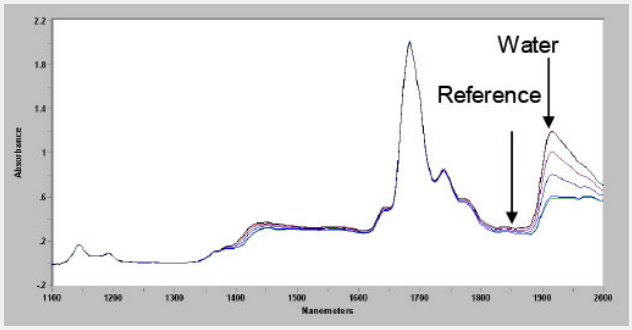

Figure 1

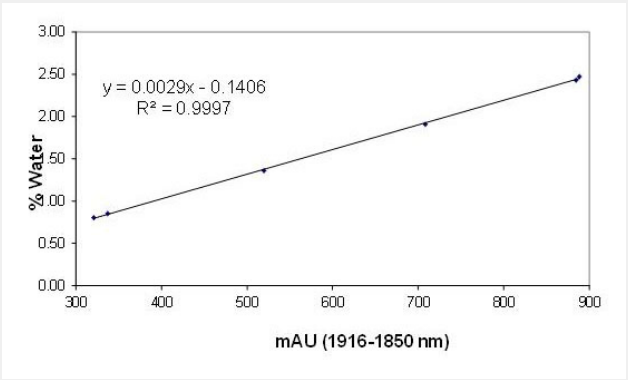

Figure 2

Results

C-H activity occurs in the 1700-1800 and 1100-1200 nm regions. The strong peaks at about 1690 and 1150 nm are due to aromatic C-H. Water occurs in two regions at 1430 nm, and more strongly at 1916 nm.

A photometer operates by analyzing differential absorbance between a reference wavelength and the peak water wavelength. In this case, a reference wavelength near the 1916 nm water peak is chosen at 1850 nm.

The absorbances for all samples were determined from these spectra and plotted against water content. See Figure 2. The resulting linear regression is excellent. The slope of the regression shows 0.003%water/mAU. The long-term drift of our ClearView db photometer is <500µAU. We expect the precision of this on-line analysis to be excellent.

It is important to minimize sample temperature fluctuations and the presence of particulates to achieve the stated precision. ClearView db can be equipped with an RTD temperature sensor for automatic temperature compensation. Thus, we can run your samples at several temperatures in a final calibration before shipping the analyzer. The resulting calibration would have coeffi cients for both absorbance and temperature.

Conclusions

Our ClearView db photometer can measure water in complex mixtures to better than ±0.01% (wt.). It can utilize up to 2 fiber optic insertion probes flanged directly into a reactor or column, or flow cells on a slip stream for even better cost per sample point.

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