Guided Wave
INCORPORATED

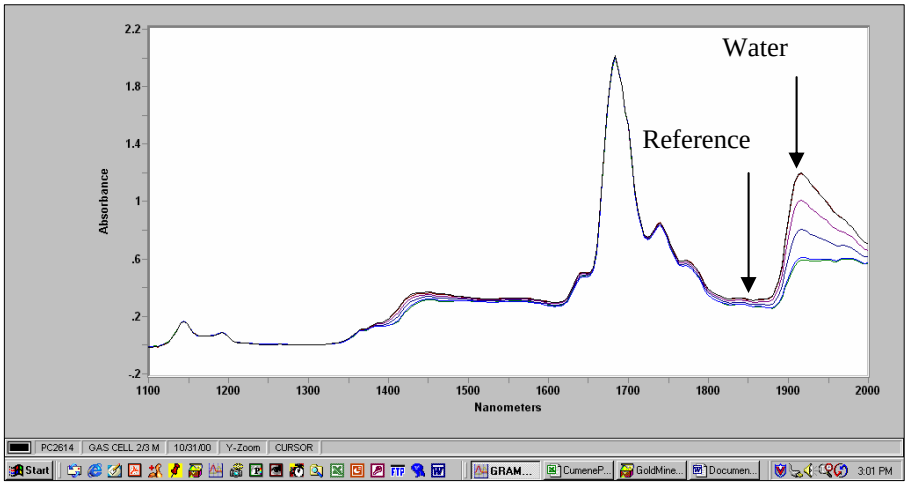
Process Analytical Systems

Application Note —

Water in Aromatic/Acetone Mixtures with a ChemView® Photometer

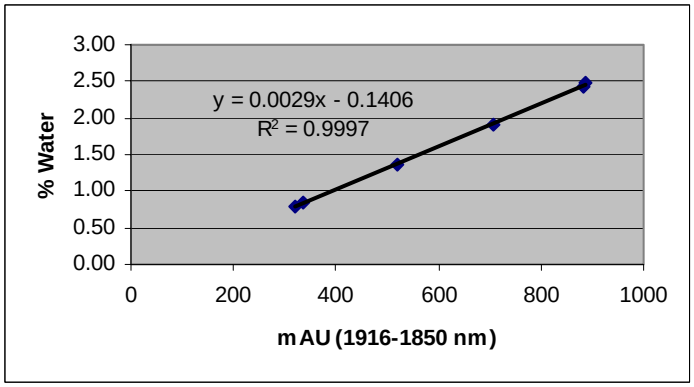
Objective:
Measure water to better than ±0.01% (wt.) in an aromatic liquid mixture with a ChemView® photometer.

Experimental:
Samples were measured in a 5 mm cuvette in our HeaterCell fiber optic accessory at 47 ºC in the NIR with our PS-2E diode array spectrophotometer. Water concentrations were determined by KF titration. Samples contain isopropyl benzene, acetone and phenol in approximately constant ratios.



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 in the following graph. The resulting linear regression is excellent. The slope of the regression shows 0.003%water/mAU. The long-term (monthly) drift of our ChemView® photometer is 1-2 mAU. We use this to determine the precision of the measurement. Therefore, we expect the precision of this on-line analysis to be 0.003 to 0.006% water.

It is important to minimize sample temperature fluctuations and the presence of particulates to achieve the stated precision. ChemView® 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 coefficients for both absorbance and temperature.

Conclusions:
A ChemView® photometer can measure water in complex mixtures to better than ±0.01% (wt.) with no moving parts. It can utilize fiber optic insertion probes flanged directly a reactor or column, or flow probes on a slip stream. Our Simulplex™ version can measure two probes with simultaneous output and no moving parts.

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