

Application Note:

Water Analysis in an Alcohol-Brine Solution with a ClearView® db Photometer

Purpose

Measurement of water in a multiple alcohol and brine solution with a ClearView db photometer.

Experimental

A fiber optic diode array NIR spectrometer and 2 low-OH optical fibers were used to obtain spectra in a 5mm cuvette at 30°C of the samples shown in Table 1.

Near-infrared (NIR) spectra are rich in chemical information. These spectra are complex with overlapping peaks from water and alcohols, as shown in Figure 1.

Results

A careful analysis of the spectra reveals that a single wavelength at 1820 nm measures water with minimal interferences from methanol and isopropanol (see Figure 2).

This wavelength is sensitive to water because it lies between the O-H peak from water at 1440 nm and the intense H-O-H peak near 1930 nm. It is, however, at a longer wavelength than the nearby alcohol peaks. It is also much less intense than the main water peak at 1440 nm, thereby allowing a probe to be used with a longer optical path, such as 5 mm, for better sensitivity.

Lastly, an added benefit in using this longer wavelength for water is its low sensitivity to sample temperature changes. Variation of $\pm 5^\circ\text{C}$ changes the predicted water content by less than 0.7% (without correcting for temperature). ClearView db can measure the sample temperature input from an RTD and make this correction, if needed.

Conclusion

These results indicate that a ClearView db fiber optic filter photometer with an analyzing wavelength of 1820 nm and a reference wavelength near 1050 nm can analyze water in the presence of alcohols and salt.

Sample	Water	Methanol	Isopropanol	NaCl (wt%)
1	37.9	51.2	10.9	4.12
2	28.8	63.2	8.0	0.36
3	34.2	44.2	21.6	4.83
4	31.7	54.4	13.9	2.02
5	41.6	38.7	19.7	3.15
6	33.5	51.7	14.8	0.95
7	39.6	42.8	17.6	2.66

Table 1

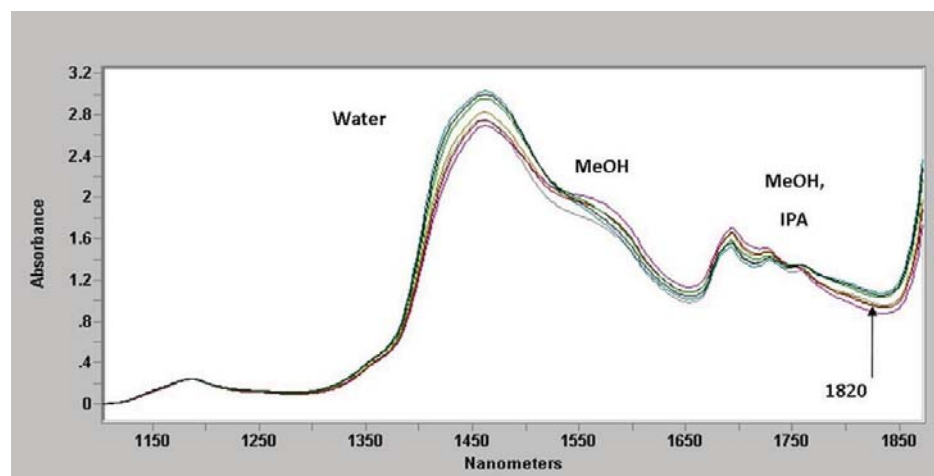


Figure 1

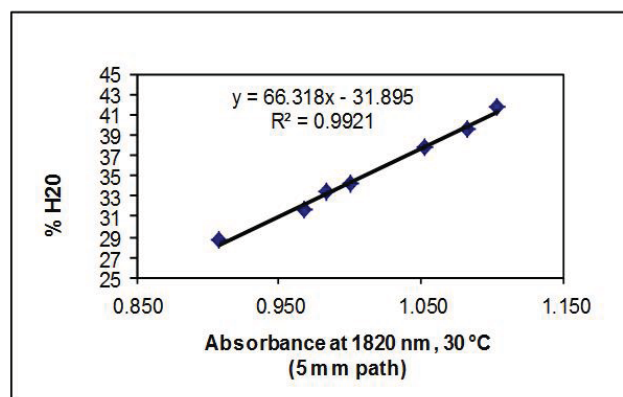


Figure 2