Application Note
UV-0005

Water Analysis using a 30 cm Cell

Introduction

Public and private water facilities test and purify clean drinking and environmental water sources daily. However, water purification processes can produce carcinogenic biproducts which must be identified and removed for health and water quality purposes. While numerous testing procedures exist, the method for testing drinking water is a color analysis, since this can indicate the concentration of humic materials that are precursors to carcinogenic trihalomethane. The simplest method of color analysis defined in testing methods for drinking water is a visual check with color comparison tubes. However, results of this method depend the observer's perception and are not truly quantitative.

V-670
UV-Visible Spectrophotometer

This application note introduces a new method to analyze superficially clean water with a UV-Vis spectrophotometer and a 30 cm pathlength cell. The extended sample compartment is dedicated for the 30 cm cylindrical cell (Figure 1), which provides precise measurements of samples with extremely low absorbance values that cannot be measured by the standard 10-100 mm cells. By placing an integrating sphere in the extended compartment, all transmitted light can be obtained and integrated to achieve the maximum absorption signal.

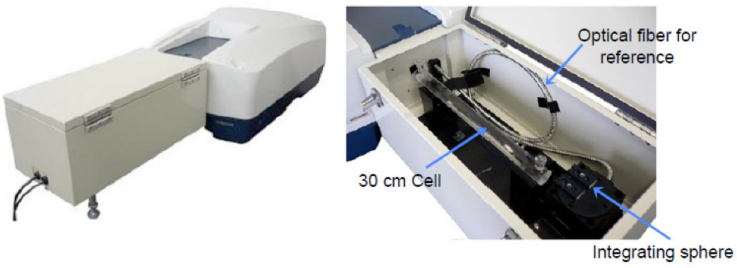

Figure 1. Extended sample compartment (left) and 30 cm pathlength cell (right).

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Keywords

V-650/660/670, UV-Visible/NIR, Water Analysis, Materials, Quantitation, Integrating sphere

Experimental

Measurement Conditions			
Measurement Range	850-220 nm	Data Pitch	0.5 nm
Slit Width	L5 nm	Response	Medium
Scanning Speed	400 nm/min		

Results

Each water sample was measured using the 30 cm cell and subtracted using a baseline air measurement. The ultra-pure water provided the lowest absorbance throughout the entire wavelength range as seen in Figure 2. Since the ultrapure water is considered to be almost clear, the ultra-pure water spectrum was further employed as a reference to cancel any reflection or absorptions of the sample cell. The corrected spectra for each sample are displayed as Figure 3.

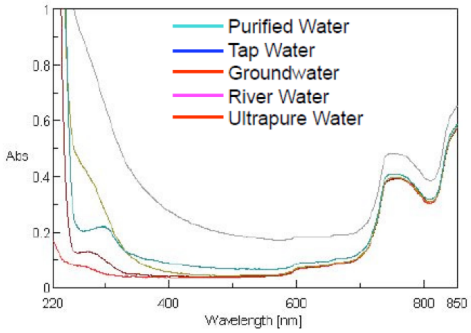

Figure 2. Absorption spectra of water samples.

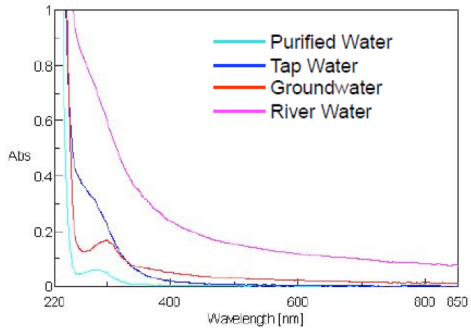

Figure 3. Absorption spectra of ultrapure-corrected water samples.

The results obtained with the 30 cm cell were analyzed with the [Color Diagnosis] program, and then plotted on the chromaticity diagram shown in Figure 4. To demonstrate that the color differences of the water samples cannot be clearly defined using the 10 mm cell, additional samples were measured with a 10 mm cell and the same calculation was performed and shown in Figure 5.

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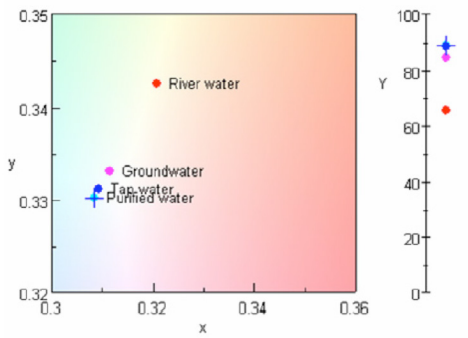

Figure 4. Chromaticity diagram of water sample results using the 30 cm cell.

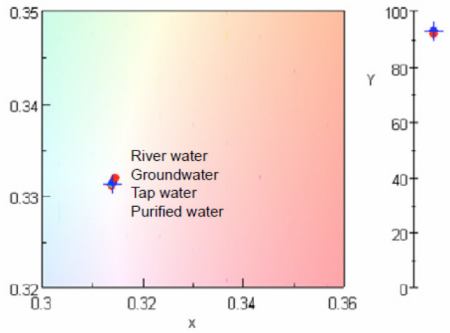

Figure 5. Chromaticity diagram of water sample results using the 10 mm cell.

The chromaticity results indicate that river water is more yellow than the other water sources and most probably contains humic materials.

Conclusion

Using the JASCO 30 cm cell, the color of various water samples can be easily measured. This accessory is available for the measurement of extremely low concentration samples and for a wide variety of water analysis fields. The extended sample compartment can be applied not only for liquid samples, but clear baculiform solid samples such as fibers.

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