Application Note:
Colored Fraction of Dissolved Organic Matter (CDOM)

Overview

Monitoring the chromophoric or colored fraction of dissolved organic matter (CDOM) in natural waters can be an extremely useful tool in a variety of marine and freshwater applications. Scientists have developed numerous methods for measuring or estimating DOM concentration for a variety of biological, chemical and physical research and monitoring topics. Fluorescence detection of CDOM is the easiest and fastest means of estimating DOM by taking advantage of CDOM's natural fluorescent property of absorbing UV light and fluorescing blue light. CDOM measurement is also of interest to researchers due to its effect on light in surface waters and as a natural water mass tracer.

Fluorescence detection using Turner Designs' Cyclops-7 Submersible Fluorometer is more sensitive, faster and less expensive than other qualitative measures and requires no sample handling. Natural water fluorescence data can be collected without the need to conduct extractions or other sample preparations. Although fluorescence data from natural water is a qualitative measurement, this data has been shown to correlate well with extracted DOM data.[1,2] Due to the sensitivity and ease of use of the fluorometer, data can be collected easily and quickly in virtually any environment.

Monitoring of CDOM in a continuous, flow-through mode using the 10-AU-005-CE Field Fluorometer eliminates the problems associated with sample collection and storage and allows for the automatic correction of temperature effects. Also, shipboard on-line monitoring permits the collection of large data sets along a ship's track.

Applications Include:

- Continuous monitoring of wastewater discharge. CDOM fluorescence corresponds to total organic carbon (TOC), which is an indicator of discharge water quality.
- Natural tracer of specific water bodies. CDOM concentration can indicate the dispersion, transport and mixing of a water mass.[3]
- Investigations of the magnitude of photosynthetically active radiation (PAR) and primary production due to its significant absorption of light in surface waters, especially in coastal and estuarine areas.
- Ocean color research and the effect of CDOM on satellite imagery.
- Investigations of DOM cycling and energy budgets.
- Investigations on the effects of photochemical bleaching of DOM in surface waters.
- The use of CDOM fluorescence data to calculate the fluorescent quantum yield that is then used to determine the CDOM absorption coefficient.[4]

10AU Field Fluorometer

Cyclops-7 Submersible Fluorometer

Trilogy Laboratoray Fluorometer

Ordering Information:

Cyclops-7 CDOM Subermsible Fluorometer (P/N: 2100-000-U) uses an ultraviolet light emitting diode (LED) with excitation filter for maximum sample excitation. The emission filter is designed to detect fluorescence of many different sources of CDOM. The Cyclops-7 CDOM Subermsible Fluorometer can be integrated into Turner Designs' C6 Multi-Sensor Platform (P/N: 2200-000) or any third party datalogger that can supply power and accept 0-5 volt analog signal.

The CDOM 10-AU Digital Field Fluorometer and Model 10 Analog Fluorometer optical kit (P/N: 10-303) includes two near UV mercury vapor lamps, excitation filter, and an emission filter for general CDOM detection. An attenuator plate (1:75) and a reference filter >300nm (P/N: 10-300) are also included to help increase the accuracy of CDOM estimates.

Turner Designs Trilogy Fluorometer (P/N: 7200-000) is a solid state, benchtop fluorometer that can be used for many different applications including CDOM detection. CDOM module(s) (P/N: 7200-041) can be purchased and are configured with CDOM specific excitation/emission filters. The module(s) are also configured with CDOM specific ultraviolet LED and Photodiode, which are used for sample excitation and detection, respectively.

NOTE: For those conducting research in freshwater or estuarine systems, with potentially high DOM concentrations, the 10-318R(1:5) or 10-327R(1:75) Attenuator Plate may also be necessary to prevent samples from exceeding the dynamic range of the fluorometer.

References:

1) Chen, R.F. and J.L. Bada. 1992. The fluorescence of dissolved organic matter. Mar. Chem. 37:191-221

2) Smart, P.L., B.L. Finlayson, W.D. Rylands, C.M. Ball. 1976. The relation of fluorescence to the dissolved organic carbon in surface waters. Water Res. 10: 805-811.

3) Wiley, J.D. and L.P. Atkinson. 1982. Natural fluorescence as a tracer for distinguishing between Piedmont and Coastal Plain River water in the nearshore waters of Georgia and North Carolina. Estuar. Coast. Shelf Science, 14: 29-59.

4) Vodacek, A., N.V. Blough, M.D. DeGrandpre, E.T. Peltzer, R.K. Nelson. 1997. Seasonal variation of CDOM and DOC in the Middle Atlantic Bight: Terrestrial inputs and photooxidation, Limnol Oceanogr. 42(4): 674-686.