



MINI LAB IN THE SUITCASE

— Small, Smart, Quick

— In situ examination and result

— Power supply from the notebook by USB cable

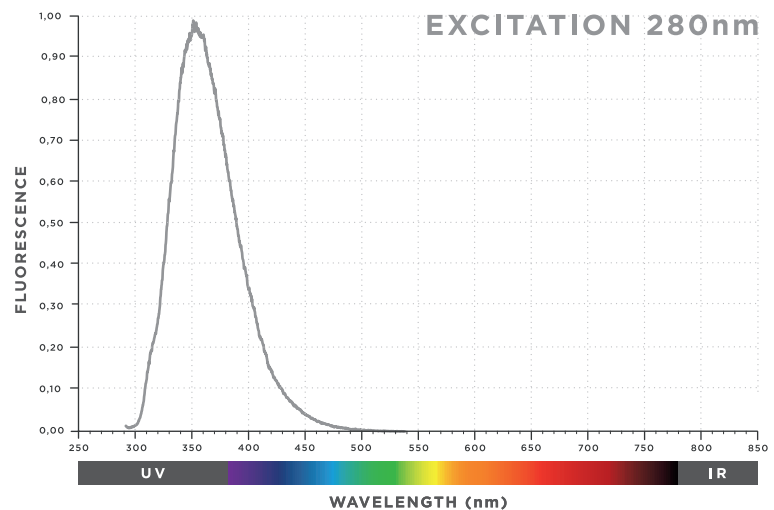


BIOMOLECULE DETECTION TECHNOLOGY BY FLUORESCENT TECHNOLOGY

In natural waters organic matter exists in dissolved, colloidal and particulate states and it may originate from a range of sources. Dissolved organic matter (DOM) is a complex and poorly understood mixture of organic polymers that plays an influential role in aquatic ecosystems and has distinctive spectrophotometric properties in terms of both absorption and fluorescence. DOM affects the colour, taste and odour of the treated water. Elevated DOM that has not been removed during the water treatment can react with disinfectants and form disinfection by-products. There is a need for simple, reproducible method for DOM characterisation and quantification during the drinking water treatment.

PROTEIN

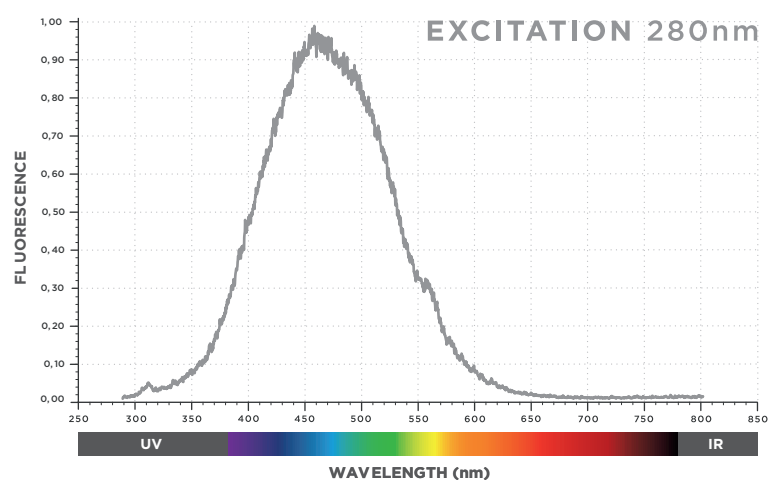
Recent studies have indicated that fluorescence spectroscopy is a rapid, sensitive and informative tool for the determination of DOM. Anthropogenic DOM sources such as farm wastes, sewage treatment outfall or sewerage over flows are all characterized by high levels of protein-like (tryptophan-like and/or tyrosine-like) fluorescence. Fluorescence characterisation of organic matter in aquatic systems has advanced significantly in recent years with technological improvements in optical instrumentation. In particular, the development of short-wave ultra-violet light emitting diodes has permitted the excitation of dissolved organic matter at ~280nm. At this wavelength, the intensity of fluorescence emitted at ~350nm (protein like fluorescence) has been shown to relate to the water quality in sewage-impacted waters. This peak has been found to correlate with Biochemical Oxygen Demand (BOD) in rivers and sewer systems over the range 1mg/l to 10,000mg/l BOD. DOM fluorescence is a sensitive tracer of sewage contamination, correlating with *Escherichia coli* abundances and nutrients across systems.



L-tryptophan fluorescence emission spectrum
(excitation light: 280 nm, emission maximum: 350 nm)

AQUATIC HUMIC SUBSTANCES

Humic substances (HSs) comprise a class of biogenic organic substances, they are ubiquitous, and as old as life on our planet. The classical definitions of HSs is: „a general category of naturally occurring heterogeneous organic substances that can generally be characterized as being yellow to black in colour, of high molecular weight, and refractory”. HSs are operationally classified by their aqueous solubility. Fulvic acids (FAs) are defined as the fraction of humic substances that is soluble under all pH conditions. FAs are the smallest members of the HS family. Humic acids (HAs) are defined as the fraction of HSs that is not soluble in water under acid conditions but becomes soluble at greater pH. Humins (HUs), the most ‘coal-like’ HS family members, are insoluble at all pHs.



Fluorescence emission spectrum of aquatic humic substances from an acid bog lake
(excitation: 280nm, emission maximum: 460nm)

In the mid of 1970's aquatic HSs were brought into focus in environmental science. The event triggering this was the discovery of the interaction between HSs and chlorine used for disinfection of drinking water. Toxic and carcinogenic substances, such as chloroform and trihalomethanes were detected in all chlorinated waters, and HSs were identified as the main precursors.

Fluorescence spectroscopy is modern, non-destructive, rapid and relatively cheap method, it was successfully used in studies of organic compounds in the fields of medicine, biology and chemistry. On the other hand, HSs is a group of compounds with a complex spatial structure showing a large number of groups with different kinds of fluorophores.

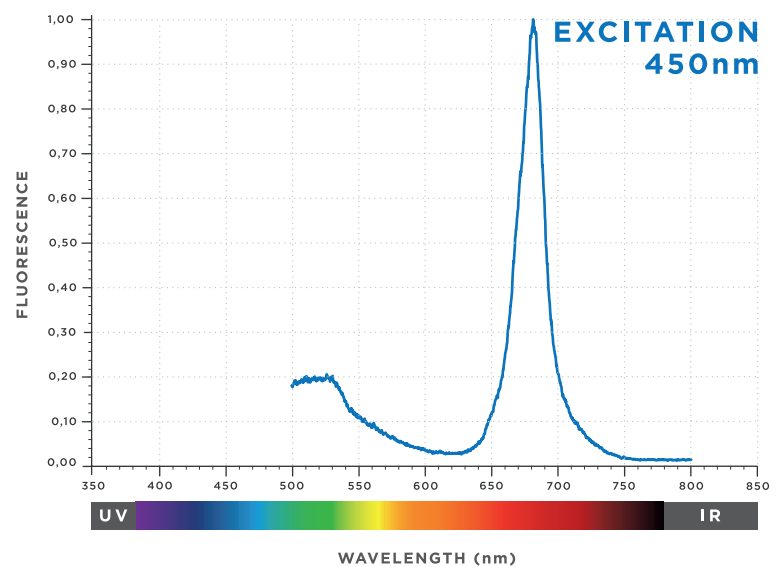
The fluorescence of aquatic HSs is commonly found in the wavelength region between 275nm and 600nm. Steady-state fluorescence techniques including emission, excitation and synchronous fluorescence spectroscopy mainly have been used for the investigation of HSs.

ALGAE

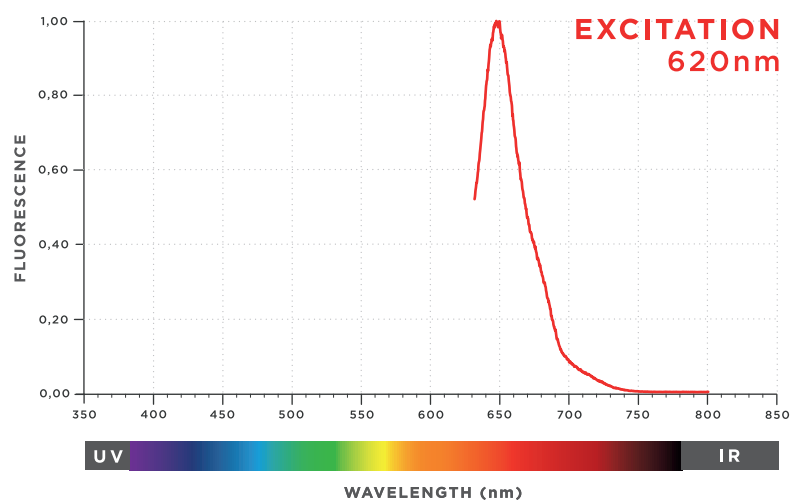
The algae are a heterogeneous group of organisms and belong to diverse evolutionary lineages. Unfortunately due to the anthropogenic water pollution some microscopic algae form harmful blooms (overgrowths of algae in water) in marine and freshwater environment. Harmful algal blooms can have severe impacts on human health, aquatic ecosystems, and the economy. Not all algal blooms are harmful, however, producing a smelly odour, or adding a bad taste to the water hurting the environment and local economies.

Harmful algal blooms in freshwaters are caused by cyanobacteria which form high biomass, produce toxins (in high enough concentrations, water treatment plants may be unable to remove the toxin), as well as taste-and-odour compounds, and have caused human illness, animal mortalities, and adverse ecosystem and economic impacts worldwide.

The in vivo fluorescence of chlorophyll a, phycocyanin and phycoerythrin afford the most sensitive and non-destructive method of quantification of algal biomass. One of the main advantage of this technique is the possible discrimination of cyanobacteria within the total algal biomass due to their specific pigments as phycocyanin and phycoerythrin. The phycocyanin in freshwater environments is reliable indicator of the quantity of cyanobacteria. The highest excitation of the chlorophyll a fluorescence of eukaryotic algae resulted from the wavelengths 420-450nm while for cyanobacteria it was observed at 620-630nm. Eukaryotic algae excited with blue light had ratio of in vivo fluorescence to extractable chlorophyll a up to 50 times greater than the cyanobacteria. These results underline the necessity of fluorescence measurements at least at two wavelengths whenever mixed population are involved.



Fluorescence emission spectrum of green algae (excitation wavelength: 450nm, emission maximum 680nm)

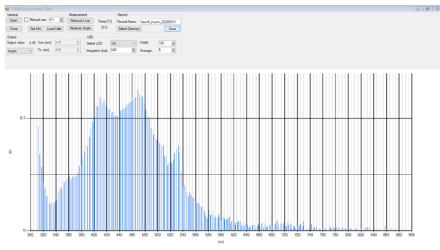


Fluorescence emission spectrum of phycocyanin rich cyanobacteria (excitation ligh: 620nm, emission maximum: 648nm)

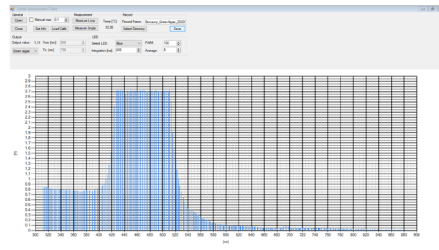




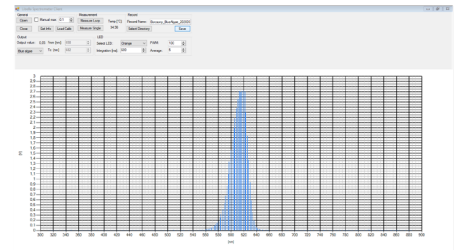
PROTEIN



AQUATIC HUMIC SUBSTANCES



GREEN ALGAE



BLUE ALGAE

TECHNICAL DATA

BIOMOLECULE DETECTION BY FLUORESCENT TECHNOLOGY

EXCITATIONS	280nm, 450nm, 620nm
SENSING	340nm ... 840nm
PROTEIN	excitation: 280nm; max. emission: 350nm
HUMIC SUBSTANCES (HSs)	excitation: 280nm; max. emission: 460nm
ALGAE	excitation: 450nm; max. emission: 680nm
CYANOBACTERIA	excitation: 620nm; max. emission: 650nm
OPERATING TEMPERATURE RANGE	0°C 60°C
MEASUREMENT RANGE	< 1 µg

OTHERS

POWER	via USB
COMMUNICATION	via USB
IP RATING (RELVANT ELECTRONIC PART)	IP66

