AMISCIENCE
ENVIRONMENT FOOD LIFE SCIENCES

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Application Note

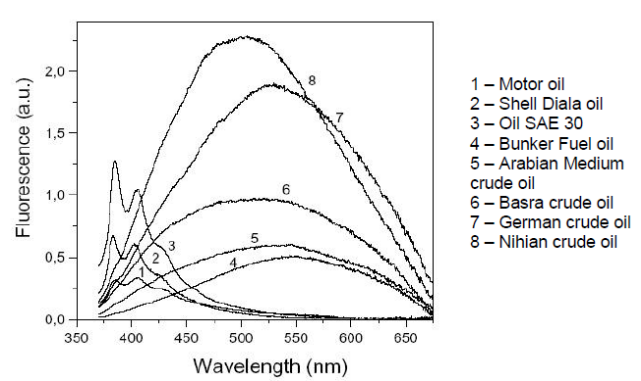
Detection of Oil Contamination Using UV Fluorometer

Background:

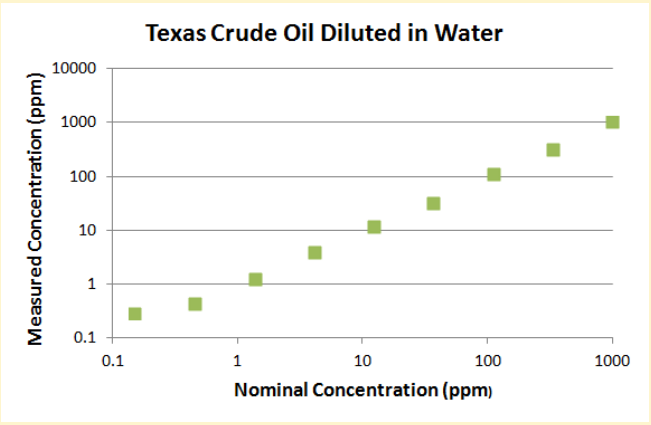
PAHs (Polycyclic Aromatic Hydrocarbons) are one of the most widespread organic pollutants. In addition to their presence in fossil fuels, they are also formed by incomplete combustion of carbon-containing fuels such as wood, coal, diesel, fat, tobacco, and incense. Because of these properties, PAHs in the environment are found in soil, sediment and oily substances, natural water bodies or, air. In addition, they are also a component of concern in particulate matter suspended in air. Hydrocarbon emissions from fossil fuel-burning engines are regulated in developed countries. Natural crude oil and coal deposits also contain significant amounts of PAHs. They are also found in processed fossil fuels, tar and various edible oils. Due to their physical properties, PAHs are widely used in many industrial applications, such as lubricating oil, hydraulic oil, and electro-hydraulic control fluid. Their applications also could produce man-made contamination in the water systems due to leakage of the oils.

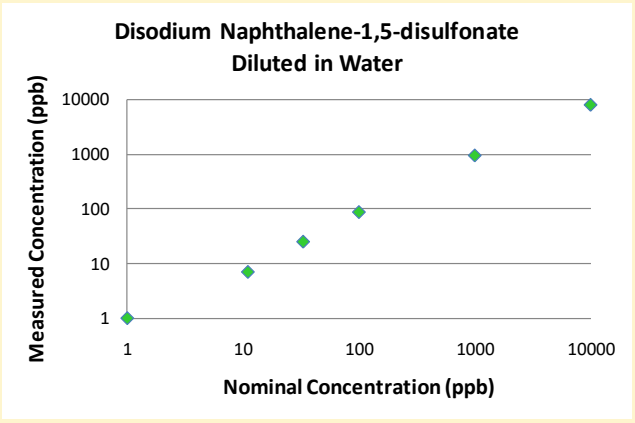
Fluorescence Detection:

The aromatic fraction of PAHs can be excited with UV light (360nm for crude oil) or deep-UV light (280nm for refined oil) to emit fluorescent light. The fluorescence intensity is linear to the concentration of the oil. This technology is ideal for monitoring leaking lube oil in the cooling systems or power plants, or leaking crude oil in ocean/lake environment, and there is no significant effect from turbidity or suspended solid in the water. The typical fluorescence spectra of different lube oils and crude oils when excited by 300-400nm light are shown below:



By utilizing the fluorescent properties of PAH's, Amiscience has developed two fluorometers, one (**P/N: FQ-C.Oil-C**) for detecting the crude oil, and one (**P/N: FQ-R.Oil-A**) for detecting refined oil. The detection performance of the fluorometers is illustrated in the following two plots:





The graphs above show the excellent linearity and detection limit for crude oil (down to 0.1-ppm) and refined oil (down to 20-ppb for disodium naphthalene-1,5-disulfonate, a compound with similar fluorescence property of PAH naphthalene). We can see that this technology has the potential of detecting sub-mg/L (< 1-ppm) level of oil contamination in water samples from the environment. And due to its high portability and low cost, it can be used anywhere in the field to conduct environmental inspection for potential oil contaminations. Amiscience also provides a dual-channel version (**P/N: FQD-R+C.Oil-A**) that combines both crude and refined oil detection capability, greatly reducing the operating cost and improving the efficiency.