TraC Detector

- Hand-Held (< 2 lbs.)
- Non-contact sensing
- Fully integrated, embedded microprocessor & controller with data storage
- Time stamped trace chemical analyzer (< 1 μg/cm^2)
- Chemical recorder
- GPS position data stamp
- Battery lifetime >40 hours

Trace Chemical (TraC) Detector

The TraC detector is a trace surface or liquid contamination detector which detects, identifies, quantifies, and records in near-real-time, trace amounts of chemical and cleaning materials on the surfaces or in liquids in manufacturing machines or manufactured products primarily in the pharmaceutical and food manufacturing industries. The TraC detector replaces the long and expensive processes of swabbing or wiping and HPLC methods for identifying trace chemical contaminants on surfaces or sampling methods for microbial consistency in the food or beverage manufacturing industries.

The TraC detector is a miniature, intrinsically safe, non-contact, reagentless, sensor capable of detecting trace levels of organic chemicals at ppb, or sub-μg/cm^2 quantities on surfaces or in liquids at working distances of several cm in less than a second.

The TraC detector is fully integrated with on board embedded microprocessor for both controlling and operating the sensor, but also for processing data to form chemical classification results, stores, and communicated data along with both a time and spatial position stamp (GPS). It addition, it has an on-board battery for over 40 hours of full time operation.

The TraC sensor employs deep UV excited native fluorescence detection methods and chemometric algorithms to identify a wide range of trace chemicals on surfaces or in liquids with a wide depth of focus to enable accurate concentration measurements without precise positioning of the instrument.

TraC sensors are customized for specific chemical sets and combinations of active ingredients, excipients, and detergents. We will work with you to provide a configuration optimized for your application.

Features

Non-contact: working distance 0.5 to 2 cm
Sampling area: 0.25 cm^2
High Sensitivity: < 1 μg/cm^2
Specificity: see next page
Detection time: << 1 s
Sample rate: > 10 samples/s
Time stamped data
GPS located data
Size: 3.5" W x 3" H x 7.5" D
Weight: <2 lb
Battery lifetime:

Standby	120 Hrs
Full power	40 Hrs

Warm-up time: < 10 s
Safety: Intrinsically safe
GMP: Designed, manufactured and calibrated to GMP standards
Built-in global instruction function (bump) test
Non-Destructive: allows further testing by other means

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1512 Industrial Park St., Covina, CA 91722 T: 626 967-6431 F: 626 967-5813 www.photonsystems.com

Fluorescence and phosphorescence emission spectra for the vast amount of materials are limited to wavelengths above 260nm (Fig. 1). Thus, exciting at shorter wavelengths will allow for the capture of spectral information that would otherwise be lost when excitation occurs at longer wavelengths.

The chemical identity of a wide range of compounds and background materials can be distinguished effectively with excitation in the deep UV using native fluorescence spectra alone using any of several statistical spectral analysis algorithms such as is illustrated in Fig. 2 using Principal Component Analysis (PCA).

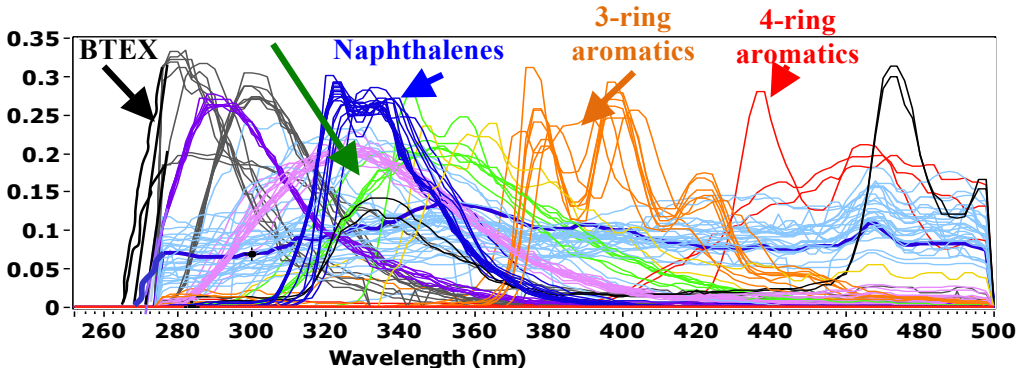

Figure 1. **Emission spectra for most organics is limited to wavelengths above 260nm.** Illustration of the range of native fluorescence emission spectra for a wide range of materials. The arrows show fluorescence data for compounds and groups of interest. Excitation below 270 nm and especially below 240 nm improves sensitivity & specificity.

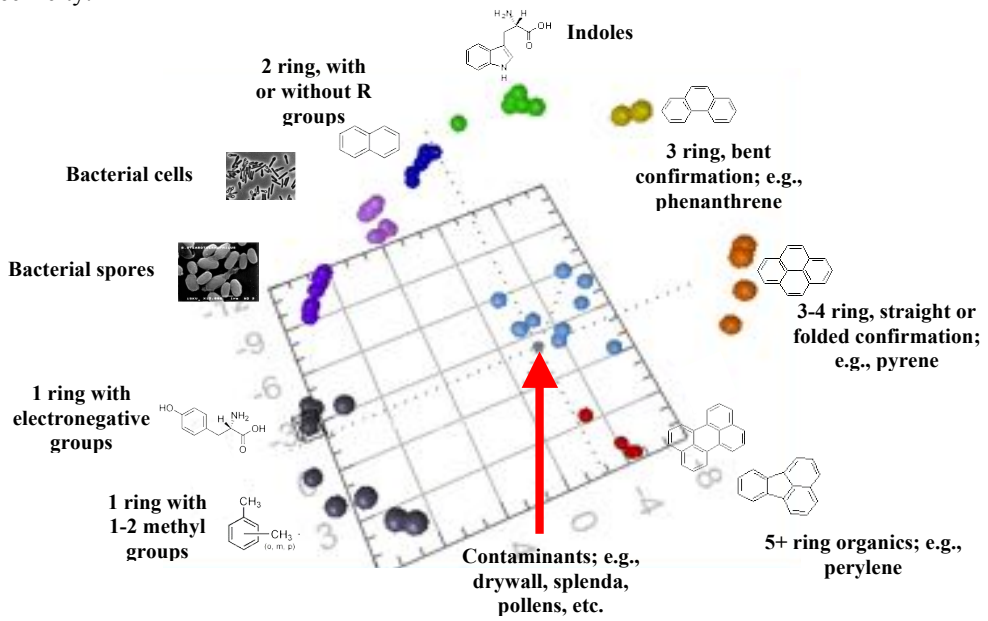

Figure 2. Excitation with deep UV enables differentiation of various chemicals. Chemometrics were based on PCA and band differencing analysis. Excitation wavelength = 235nm.

The specificity of identification can be accomplished using a limited number of selected fluorescence bands and the appropriate excitation wavelength. The target chemical groups in Fig. 2 consist of 1 ring aromatic compounds including benzene with or without various functional groups, toluene, xylene, aromatic amino acids, and other compounds, bacterial spores, vegetative bacterial cells (Gram + and Gram -) with cellular components, 2 ring aromatics including naphthalene, nitrogen based hetercycles, 3 ring polyaromatic

hydrocarbons (PAHs), 4 ring PAHs and >5 Ring PAHS. A "background" group, consisting pollen, dust, minerals, and household materials (sugar, flour, corn starch, etc.), was shown not to interfere with the target groups. Analysis of these fluorescence spectra was done using PCA and band differencing techniques to tease apart the compounds and groups. As can be seen in Fig. 2, the various groups fall in distinct spectral space using these techniques. In general, Fig. 2 provides a "chemometric" space where different compounds and classes of compounds occupy specific regions within this space. When mixtures of compounds occur simultaneously, the chemical "identity" will be dominated by the dominant compound, or when more equal, will occupy a region between the component compounds.

Process	Industry
• cleaning validation	• food manufacturing
• product quality testing & control	• pharmaceutical manufacturing
• on-line process monitoring	• chemical manufacturing
• environmental science	• semiconductor/thin film mfg
• forensics-crime scene investigation	

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