

TOXIN DIAGNOSTICS – DEVELOPMENT OF NOVEL, FIELDABLE TECHNOLOGIES TO DIAGNOSE TOXIN EXPOSURE

Direct Real-time Trace Vapors And Aerosols Chemicals Characterization With A Man-portable Mass Spectrometer

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The need to efficiently collect and identify vapors and aerosols in real-time remains imperative to chemical defense and security, among others. There are a variety of compelling reasons to develop methods for the rapid on-site detection of chemical species at trace levels with high sensitivity and specificity. Performing chemical analysis in situ without the necessity to deliver samples to the off-site analytical laboratory is advantageous in many areas of chemical analysis. Warfighters are in the need of systems able to perform rapid, sensitive, and definitive identification of traditional and newly developed toxin threat agents to support early warning and prepare for the unknown. Upon exposure, the early warning allows warfighters to quickly administer appropriate antidotes or provide supportive care to counter the threat. Most of the currently available detectors of chemical species that can be field-deployed are based on optical spectroscopy or electrochemical sensors because their miniaturization is relatively straightforward. However, there are inherent drawbacks to these technologies when dealing with trace detection and chemical discriminating ability.

Mass spectrometers are instruments that can quickly detect, identify, and quantitate a large variety of chemical species with high accuracy, chemical selectivity, and sensitivity to trace amounts of analyte. A major advantage of mass spectrometers is that the instrument response is generally within a second, i.e. in real-time, of exposure to the toxin. It is also important that the signal of interest is detectable under varying environmental conditions (e.g. rural or urban settings, varying humidity and temperatures), and distinguishable from complex chemical backgrounds, including vehicle exhaust, smoke, naturally occurring chemicals, and out-gassing materials.

BaySpec's Continuity™ fieldable mass spectrometer was developed to be used by both professionals as well as the untrained user. The self-contained system is man-portable and battery-operable that could be employed for use in chemical and biological defense (CBD) with effective vapor and aerosol ionization sources. The software is user-friendly and easy to navigate. The system is deployed quickly with rapid-start technology, which is initiated by clicking a single button. Once initialized, the system performs chemical threat detection and identification automatically. Upon detection of a toxin threat, the software provides instantaneous audio-visual feedback to the user along with relevant information on the toxin. Continuity's excellent performance against simulated threats from DARPA's SIGMA+ library has been proven in numerous field trials both in the US and abroad. Continuity can detect most chemicals in the high parts-per-trillion (ppt) range, providing early warning to warfighters.

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