Detection and Identification of Toxic Industrial Chemicals Using the CBMS II Military Reconnaissance Sensor

K.J. Hart, M.B. Wise, W.H. Griest and R.R. Smith
Oak Ridge National Laboratory

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In addition to the typical chemical and biological agent threats, there is also increased interest in toxic industrial chemicals (TICs) that may be used against military personnel abroad and as a potential terrorist threat in the U.S. A series of TICs is being surveyed to establish a library of EI, CI and MS/MS spectra for development of specific detection parameters for a ruggedized, vehicle-portable mass spectrometer, the Chemical Biological Mass Spectrometer Block II (CBMS II). Chlorine and phosgene gases, industrial chemicals used extensively in World War I, are among the volatile TICs analyzed using the EI scan mode of the CBMS II. Organo-phosphorus pesticides are of interest for several reasons including potential use as a low-grade chemical agent and for their potential for generating false positives from some nerve agent detectors.

This presentation will provide an overview of the CBMS II and recent efforts to expand the range of preprogrammed TICs that can be detected and identified by this sensor. The integrated 3-in-1 CBMS II design provides a sensitive and selective chem / bio detector for a large range of homeland defense and anti-terrorism applications. Homeland defense / anti-terrorism applications include fixed sites (buildings, tunnels, industrial plants and airports), mobile contamination characterization including railroad cars and standoff characterization for use in plume modelling by either fixed sensor grid (e.g. SENSORNET) or by using an unmanned aerial vehicle.

The CBMS II is being developed to support sampling of liquid chemical agents via a Ground Probe (Bruker) / Double Wheel Sampling System, vapor chemical agents via heated Silicosteel® sample line and bioaerosols via an aerosol particle concentrator. A multi-port valve allows selection of one of the sampling inlets under computer control. The Chem Ground mode of operation is designed to analyze samples obtained from ground surfaces to determine if an area has been contaminated with persistent chemical agents. This form of attack is usually employed to deny passage of military forces. The Chem Air mode of operation is designed to analyze air samples pulled into a heated sample line for volatile chemical agents. This form of attack is usually employed to inflict immediate casualties on a troop formation. Biological agents are usually dispersed as aerosols and directed at incapacitating or killing large numbers of personnel. The Bio mode of operation is designed to analyze bio-aerosol samples in the respirable particulate range for signatures indicative of bacteria, toxins and viruses.

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