

Field Detection of Chemical & Biological Agents
Using Ion Trap Mass Spectrometry

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A fieldable mass spectrometer has been designed to detect and identify chemical and biological agents in both reconnaissance and point detection missions on the battlefield. The analyzer used in this instrument is a custom designed ion trap mass spectrometer with complete electronic control and offline data analysis software. The instrument is equipped with a mode-select valve to provide rapid selection of one of three sampling systems: a vapor detection line for volatile chemical agents, the U.S. Army ground sampling system for liquid chemical agents and a unique aerosol concentrator / pyrolysis system for biological agents. The instrument has been designed to be mounted in Army reconnaissance vehicles such as the FOX armored vehicle and HMMWV-based systems. An ATM style user display has been designed that allows the user to configure the system and monitor alarms and other instrument functionality. The system is highly automated and requires little, if any, user interaction once started. A serial communication protocol has been developed to allow several systems to coordinate their results in a battlefield scenario.

Agents are identified using electron ionization, chemical ionization (ethanol reagent) and MS/MS spectra. The use of a rugged turbomolecular pump to provide vacuum for the analyzer and the use of chemical ionization provides a marked increase in interference rejection and decrease in instrument recovery time when battlefield interferents such as diesel fuel, fog oil and jet fuels are encountered compared to existing systems. The chemical detection scheme will be demonstrated for a variety of chemical simulants and nerve and blister agents. Interference rejection without false positives will be discussed using chemical agent data. Pilot data showing differentiation of biological simulants will also be shown.

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