LOCALIZING CHEMICAL AND BIOLOGICAL THREAT DETECTION

Wearable Chemical Sensors for Improved Situational Awareness

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The nature and number of chemical hazards have grown significantly over the last 20 years. The concept of "weapons of mass destruction" (WMD) has been supplanted to some degree by the concept of weapons of mass disruption and casualty. Common chemicals such as acids, bases, accelerants, and a host of pharmaceuticals are of growing concern as they can be procured by non-State actors and readily deployed by unskilled individuals. The chemical detectors currently in use by the Joint Services, related Government agencies, and civilian emergency responders are generally limited in the number or type of threats detectable. N5 Sensors, Inc. (N5) is developing wearable sensors and related enabling technology for detection of chemical threats and environmental parameters. The ChemBadge™ provides real-time detection in a single device of multiple classes of chemical threats including Toxic Industrial Chemicals (TICs) and Chemical Warfare Agents (CWAs) for person centric situational awareness. The ChemBadge™ is based on N5's proprietary Semiconductor Photocatalytic Hybrid (SPH™) sensing technology that enables continuous monitoring, classification and semi-quantification of hazardous gases. The SPH™ sensors are configured as an array so that multiple classes of chemical can be detected with a very low nuisance alarm rate. The ChemBadge system features low size, weight and power making it suitable as both a wearable device and as a payload for use with unmanned aerial and ground vehicles. Some of the new chemical detectors in development, while highly capable, are not suitable for person-worn or unmanned applications. Advanced machine learning (ML) algorithms enable improved decision making, networking, and data distribution to a common operating picture consistent with a layered and flexible defense strategy. The core SPH™ sensor technology has also been incorporated into multi-modal detection systems where data is fused and analyzed to improve measurement fidelity. This points to the potential for eventual incorporation of human physiological data and biomarkers into the wearable device. N5 is currently testing the SPH™ sensors for detection of breath biomarkers. The ChemBadge wearable has been tested in multiple Government and third-party test events. In addition, an aerosol sampling module is under development for detection of next-generation chemical threats and pharmaceutical based agents.