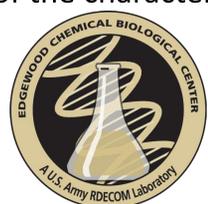


Motivation

Colorimetric sensor arrays (CSAs) have emerged as a versatile approach towards the identification of unknown substances, contaminants, infectious agents, and even infestation. The basic interaction modality consists of volatile organic components permeating the array of dye chemistries to specifically react with elements of the CSA to yield a difference pattern, which can be characterized as a signature of the species that gives rise to the characteristic response. Our interest is twofold: 1) establish a broad library of array responses to a panel of neat compounds and mixtures in order to define and quantify the basic discriminating power and reliability of the technology for identification, and 2) to explore options for accelerating the mass transport-limited process.

Lines of Effort

Our main objective is to harvest controlled exposure data for the rigorous characterization of the identification performance, response time, and repeatability/reliability of the CSA response on exposure to a broad range compounds and etiologic agents of concern to the defense community. We are partnered with Dstl, Porton Down in a Coalition Warfare Program project to collaborate on the diagnostic power of the CSA technology towards the recognition of disease in clinical samples and cultures. We are partnered with Naval Research Laboratory to investigate the application of proven sorbent technology to expedite the sampling of volatile organics in order to optimize the mass transport to the CSA and accelerate the development of the characteristic signature.



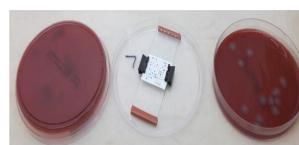
Static Vapor Headspace

The workhorse for the signature library development across all lines of effort is an imager. A flatbed scanner is used in a laboratory setting along with a sample container assembly that facilitates the exposure of the array to the headspace of the sample.

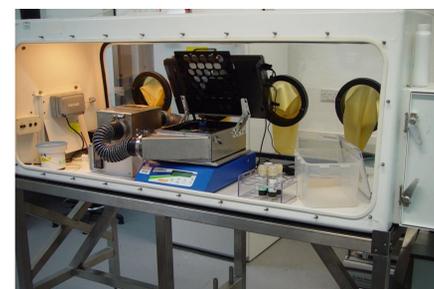
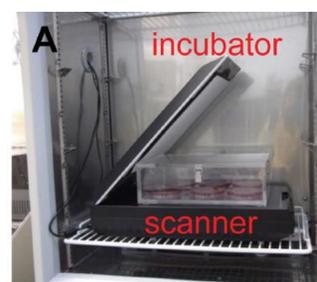


Clinical and Culture Samples

Dstl is undertaking a comprehensive study of the application of the CSA technology towards disease diagnostics and etiologic infectious agent identification. Aside from the specific types of samples and handling procedures, the procedures for capturing relevant signature data are essentially the same as those used by ECBC for static chemical vapors.



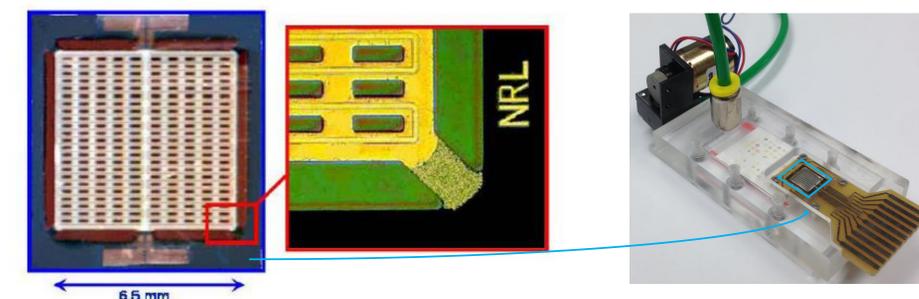
Genus	Species
Bacillus	<i>B. Anthracis</i> (10), <i>B. thuringiensis</i> (1), <i>B. cereus</i> (1)
Burkholderia	<i>B. Mallei</i> (5), <i>B. pseudomallei</i> (6), <i>B. thailandensis</i> (3), <i>B. cepacia</i> (1)
Francisella	<i>F. Novicida</i> (1), <i>F. tularensis</i> (6)
Yersinia	<i>Y. Pestis</i> (9), <i>Y. pseudotuberculosis</i> (1)
Coxiella	<i>C. Burnetii</i> (1)



Blood Culture in High Containment

Dynamic Vapor Sampling

The NRL CASPAR technology consists of an innovative low impedance, low mass, high efficiency polymer-based sorbent. We are exploring integration concepts that would actively draw in a sample, then rapidly heat the CASPAR matrix to desorb a relatively high-concentration slug of the trapped volatiles, then to immediately but temporarily stop the flow to allow maximum exposure efficacy/mass transport to the CSA.



Future Directions

The CSA technology lends itself to a broad spectrum of applications. Our principal interest in developing a signature library is to inform the advancement of this technology into a reader/identifier prototype. The reader/identifier would consist of a standalone imager (e.g., digital camera) that would serve in place of the flatbed scanner we use in the laboratory. We will assess the calibration transfer of the laboratory signature library to the reader/identifier imager by applying the signal processing approach developed by Dr. Charlie Davidson (see companion posters by Miklos and Davidson) and assessing the reliability of the imager vis-à-vis laboratory data library harvested on the flatbed scanner.

Acknowledgements

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