Soft Target Engineering to Neutralize the Threat Reality

RB.1: The Digital Dog Nose™

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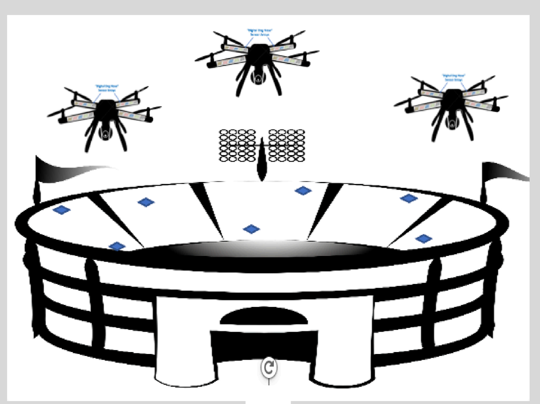
SENTRY Challenge

Currently, canines are tasked with patrolling soft targets and crowded places (STCPs) for threats to public safety. However, they lose effectiveness after several hours and require significant training and rest. Additional screening protocols are not portable and do not possess the sensitivity and selectivity to compete with a dog. Thus, there is a need for a portable detection system capable of real-time, continuous identification and differentiation of concealed threats at levels better than a dog's nose.



Accomplishments

Performance Metrics: Our primary goal is to create Digital Dog Nose™ (DDN) sensor arrays with ppq-level sensitivity and specificity with the ability to identify concealed threats and track vapor plumes to a source.

Project Milestones:

- Expand threat recognition library to include soft threats
- Determine/mitigate interferent effects
- Demonstrate detection of concealed threats
- Demonstrate identification and differentiation of concealed threats

Addressing the Challenge

DDN Sensors

- Unparalleled sensitivity (<ppq)
- Lightweight (<10mg)
- Low-power (<150mW)
- Real-time, continuous detection
- Precise differentiation & identification
- Platform agnostic
- Tunable for several target compounds including explosives, narcotics, gun oils, and many more

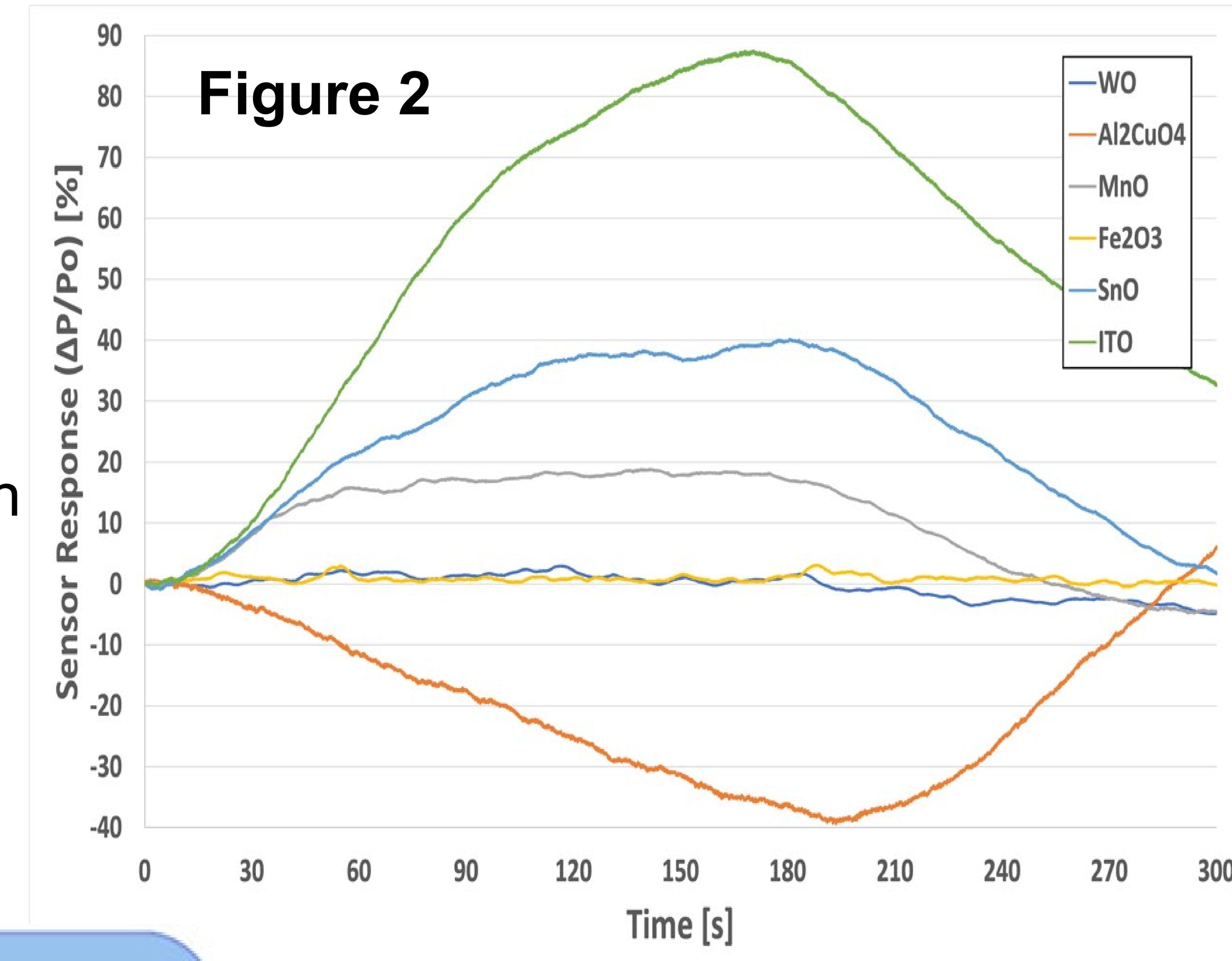
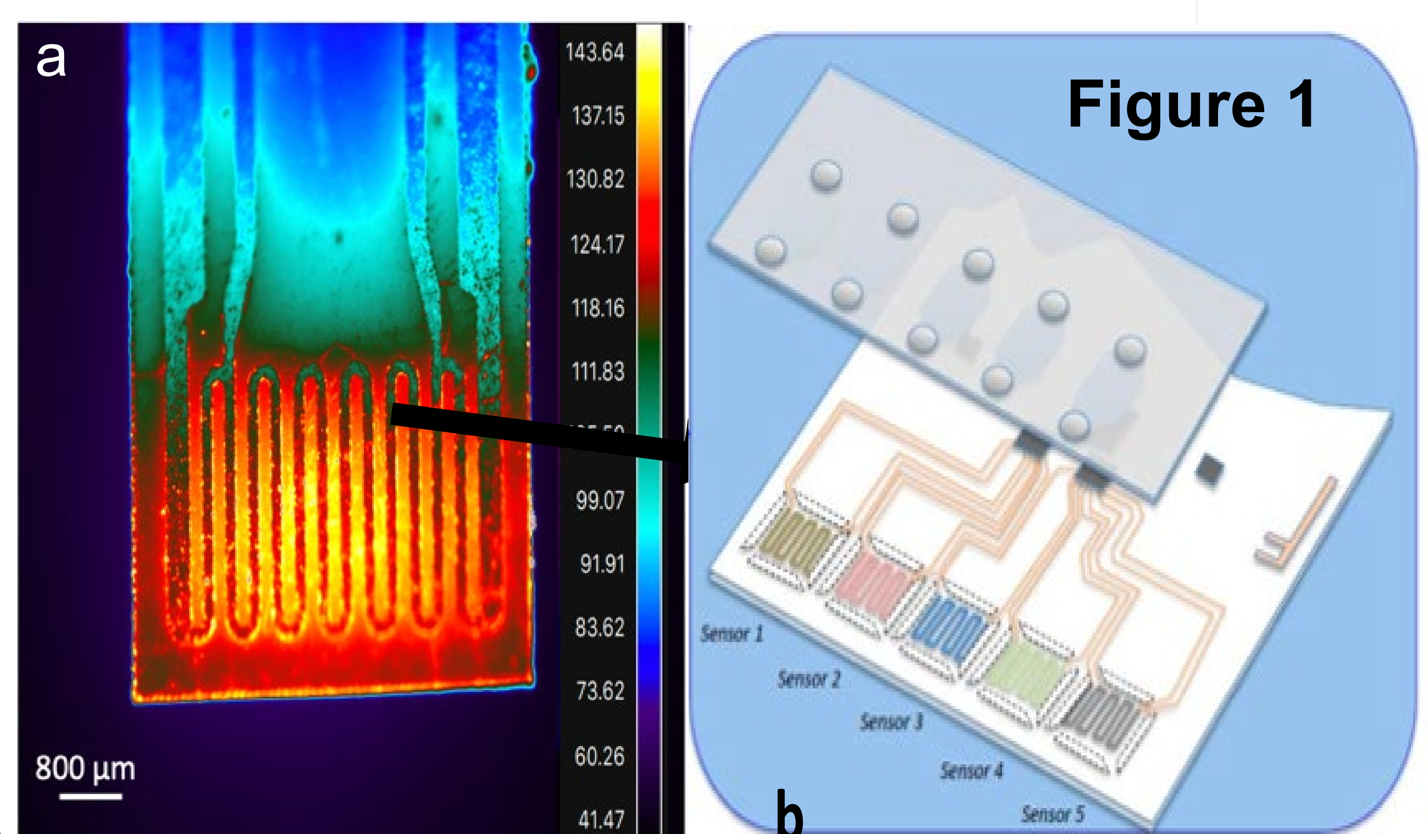


Figure 3	Catalyst 1	Catalyst 2	Catalyst 3	Catalyst 4	Catalyst 5	Catalyst 6	Catalyst 7
Hoppe's No. 9	+	-	-	+	+	+	+
Rem Oil	NR	-	-	+	NR	+	NR
Black Powder	NR	-	NR	+	+	+	+
2-propanol*	-	-	-	+	+	+	+
Ethanol*	+	-	+	-	-	+	+
Deodorant	NR	-	NR	+	NR	+	NR
Perfume	+	-	NR	+	NR	+	NR
Toothpaste	NR	-	NR	+	+	+	+

Legend:
Green (+) → Positive Response (Endothermic)
Red (-) → Negative Response (Exothermic)
NR → No Response



DDN sensors (Figure 1) have demonstrated the capability of detecting concealed threats by interrogating the explosive vapors emanating through the walls and zipper of a suitcase (Figure 2). Our sensor arrays generate unique "fingerprints" that can be utilized for precise identification and differentiation. Figure 3 shows a summary of the qualitative responses of each DDN sensor catalyst to number of gun oils, gun oil ingredients*, and common interferents.

Next Steps

Transition Strategy: Researchers are already working to make DDN thermodynamic sensors sufficiently light & inexpensive so that arrays can be mounted inconspicuously throughout arenas, shopping centers, etc. or placed on mobile platforms for the detection for explosives and soft threats.

Partnerships & Stakeholders: These sensors promise to be of great interest to government entities such as TSA, CBP, DARPA , the military. Private companies & security vendors are also potential partners to transition.

Virtual SENTRY Framework: This project provides the Virtual SENTRY with the ability to detect diverse, non-specific threats—Chem/Bio, Explosive in the vapor surrounding STCPs. Drone-mounted, they have the ability to track to source —a feature, to date, only a dream.

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