SAND2024-07325C

2024 COUNTER WMD INNOVATION CHALLENGE

Towards ubiquitous and wearable threat sensors

Sandia National Laboratories

Evolving CBRNE landscapes, constrained **top-down** sensing paradigms

CBRNE threats as economic and infrastructure disruptors

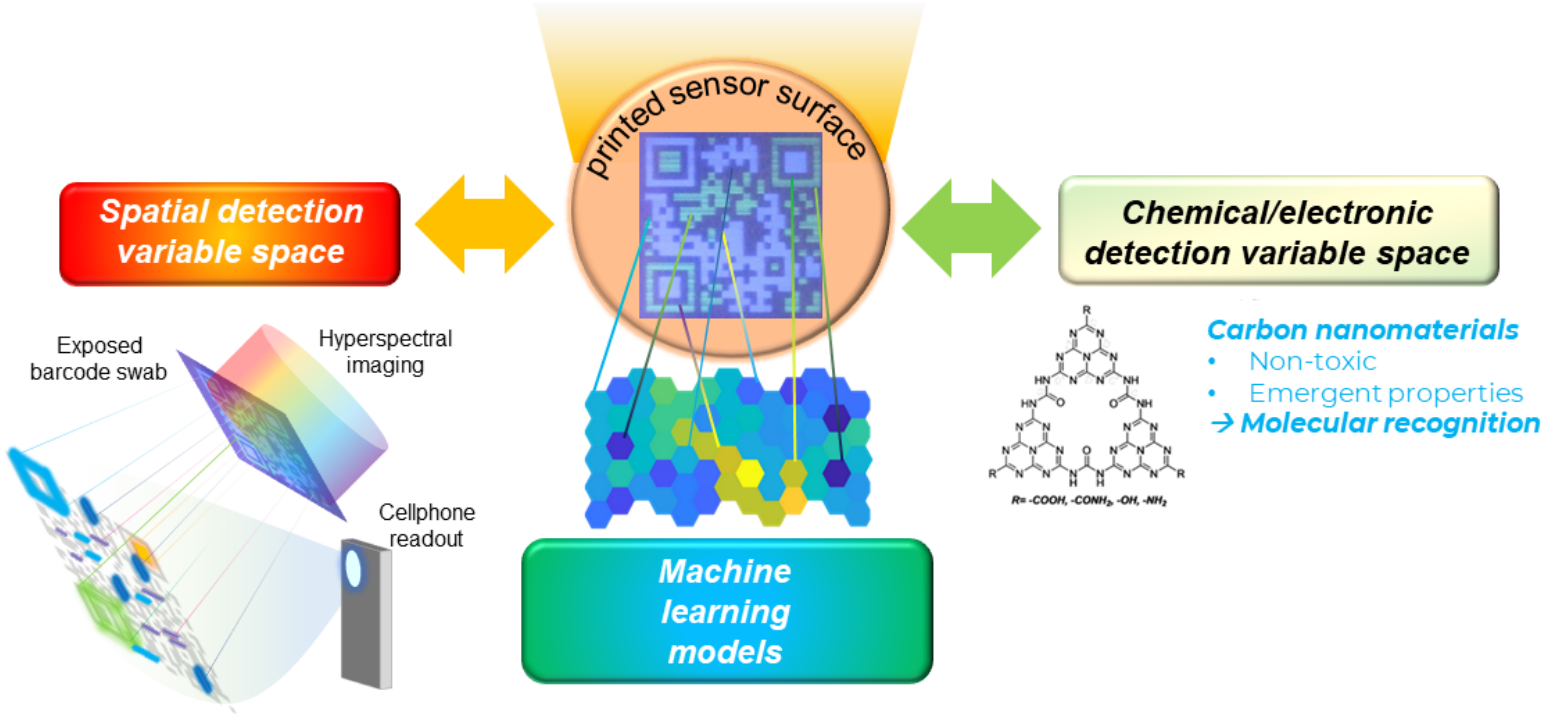
Bottom-up approach to adaptable, wearable sensors

- Threat-agnostic sensing
- New carbon-based nanomaterials

→*Robust, printable and tunable*

Multiplexing capable with cell phone camera readout

Multi-dimensional information encoding:
Intelligent Systems/ Internet of Things



Homeland threat assessment report, 2024
DARPA strategy, 2021

Anticipated applications and impact

Wearable sensors from inexpensive and renewable sources with ease of processing and configurability for broad threat sensing solutions

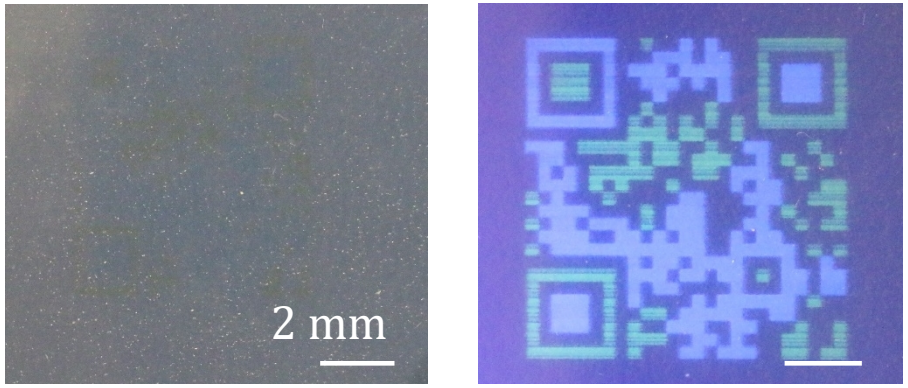
Military
- Increased warfighter agility
- Rapid feedback for critical decision making
- Simple processing and readout

→ *Minimal technical expertise required*

Civilian
- First filter detection
- Security

→ *Transportation screening, illegal drug detection and anti-tampering*

Barcode swab printed from 3 carbon dot inks



Light off | Light on

Commercial Value

Prospective partners

Leidos
Chemring
Teledyne
GE
Smiths
Avon
Protection

Key activities

Synthesis of non-toxic carbon nanomaterial inks; water-based inkjet printing; sensor imaging and threat differentiation (barcode tampering pattern); data clustering and modeling

Key resources

LDRD support

Value proposition

Inkjet printed, barcode patterned sensor surfaces use inexpensive, non-toxic and multi-functional carbon nanomaterials to rapidly detect and differentiate multiple threats

Novel hyperspectral imaging probes and machine learning models offer easy-to-use platform with cell phone technology for on-site analysis

Customer Relationship

CRADA
NDA

Channels

Technology transition through IP

Customer Segments

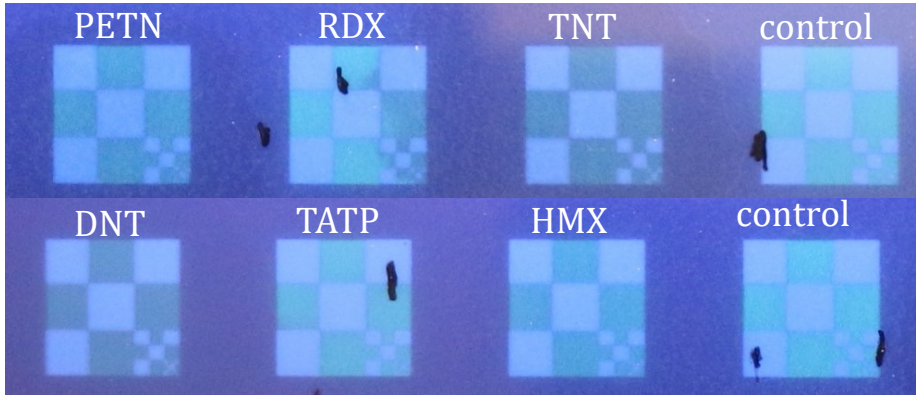
Internal stakeholder (NA-22, 84) concerning field-deployable energetics sensor

Revenue streams: According to three different market reports, global CBRNE hazards monitoring market can grow for up to 27 billion by 2027 with a CAGR of 5.9%

Opportunities

Chemical and spatial information encoding

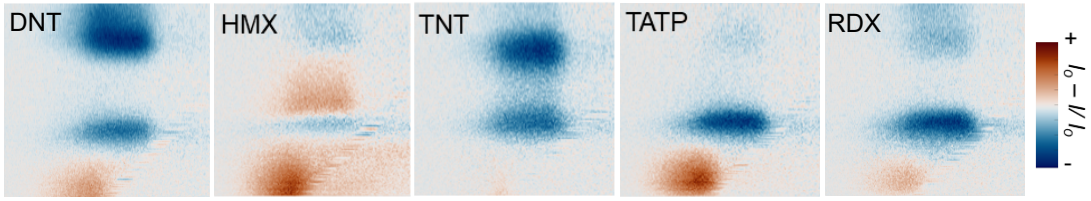
Barcode arrays exposed to trace explosives



Technology maturation with commercial partners through SBIR, external funding

Desired TRL 6: field-deployable and wearable ubiquitous sensors

Multi-reporter states for differentiation



Westphal et al. Submitted

Current TRL 3: 3 Ph.D. scientists (staff and postdoc), 2 graduate student interns

Contact Information

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WHERE INNOVATION BEGINS

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