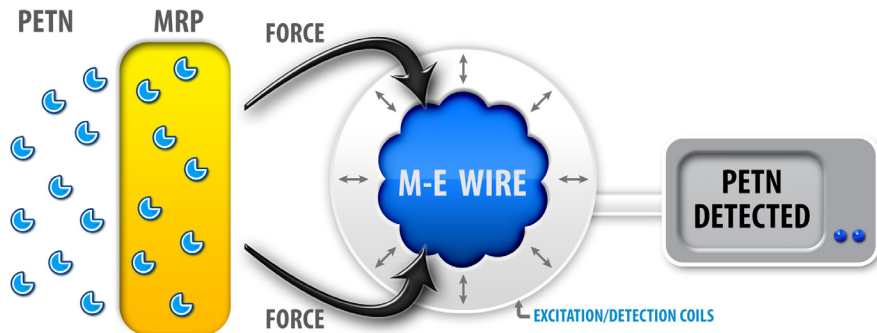
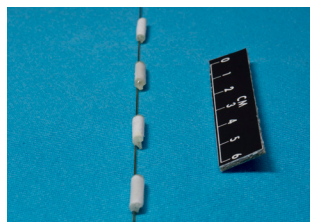


ChIMES: A New Broadly Applicable Chemical Sensor



▲ Conceptual drawing of ChIMES sensor

→ Four-TRM array



In collaboration with the University of Tennessee, Y-12 has developed a new low-cost sensor technology, known as ChIMES (Chemical Identification by Magneto-Elastic Sensing), that uses target response material (TRMs) as actuators in magneto-elastic sensors. TRMs can come from many classes of chemical and biochemical compounds, with many degrees of selectivity. TRMs with strong affinities for specific targets can be used individually, while TRMs with distributed selectivity can be formed into arrays with an artificial neural network or other artificial-intelligence-based tool used for analysis and interpretation. The magneto-elastic components are amorphous ferromagnetic alloys with high permeability and very low coercivity. When a TRM encounters a target, it imposes forces that change the magnetic properties of the alloy in ways that can be detected with an excitation-detection coil set.

DETECTOR / SENSOR / IMAGING

Features & Benefits

- Can detect anything for which TRMs can be identified or developed.
- Capable of untethered communication through a nonmetallic or thin metallic barrier.
- Miniaturizable and energy-efficient enough for powering with on-board batteries.
- The sensor's shape, size, and appearance can be tailored to a specific need.
- Suitable for both overt and covert applications.
- With modular TRMs, can detect multiple and variable targets simultaneously.
- Much less expensive than techniques like gas chromatography.

- Volatile organic compounds (VOCs) and other air- and water-borne pollutants.
- Food freshness and safety.

Patents & Awards

- U.S. Patent Nos. 8,871,523 and 9,255,920
- U.S. Patent Application No. 14/842,007

Inventors

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University of Tennessee: M.J. Sepaniak

Technology Readiness Level (1–9)



Component and/or breadboard validation in relevant environment.

Applications

- Explosives or taggants.
- Chemical and biological warfare agents, and precursors or by-products of CBRNe manufacture.
- Exhaled gas constituents for health diagnostics and drug detection.
- Toxic industrial chemicals (TICs) and materials (TIMs)

Partnering Opportunities

Y-12 is seeking an industry partner to fully commercialize this technology.

**If you would like more information, please contact the
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