Research team develops a wireless sensor for spotting chemical warfare agents

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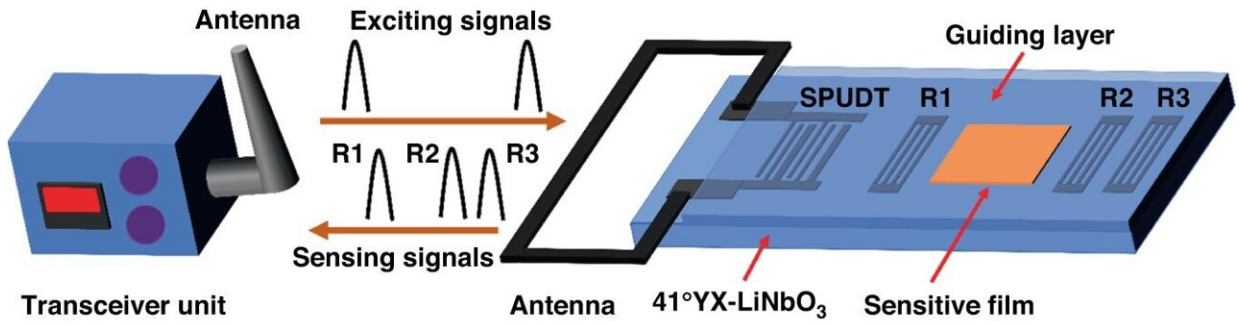

Schematic and working principle of the proposed SAW chemical sensor. Credit: *Microsystems & Nanoengineering* (2024). DOI: 10.1038/s41378-023-00627-8

The urgent need for advanced detection of chemical warfare agents (CWAs) to ensure global security has led to the development of a novel gas sensor. This sensor is distinguished by its rapid response, high sensitivity, and compact size, crucial for the early detection of CWAs.

Accurate detection and monitoring of CWAs are vital for effective defense operations, both military and civilian. Due to the hazardous nature of CWAs, research is typically limited to authorized laboratories using simulants that mimic CWAs' chemical structure without their toxic effects.

A team of experts published a study on January 3, 2024, in the journal

Microsystems & Nanoengineering, that introduces a cutting-edge sensor that wirelessly identifies chemical warfare agents. This device efficiently detects DMMP, enhancing threat response capabilities without relying on power sources or connections.

The researchers have innovated a passive, wireless sensor system using surface acoustic wave (SAW) technology, set to revolutionize chemical warfare agent detection by specifically targeting dimethyl methylphosphonate (DMMP), a simulant for nerve agents. This sensor operates at 433 MHz, using a unique coating of fluoroalcohol polysiloxane (SXFA) on a lithium niobate substrate, enhancing its sensitivity and stability under various environmental conditions.

The system's core is built around a YZ lithium niobate substrate equipped with metallic interdigital transducers (IDTs) and an attached antenna. The SXFA film's interaction with DMMP alters the SAW's properties, such as velocity, enabling precise detection. This design ensures stable operation within a 0–90 cm transmission range and is resilient across a wide temperature range (-30°C to 100°C) and humidity levels up to 60% RH.

According to the research team, this sensor system marks a significant leap forward in CWA detection technology. Its passive wireless nature allows operation in inaccessible or hazardous areas, ensuring safety and efficiency.

This technology has immense potential in military and civilian defense, offering a reliable, efficient means of early CWA detection. Its ability to operate wirelessly and in challenging environments makes it a valuable tool for ensuring public safety and preparedness against chemical threats.

More information: Yong Pan et al, A passive wireless surface acoustic wave (SAW) sensor system for detecting warfare agents based

on fluoroalcohol polysiloxane film, *Microsystems & Nanoengineering* (2024). DOI: 10.1038/s41378-023-00627-8

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