# METHOD TO SUPPRESS SILOXANE POISONING OF METAL OXIDE SENSORS

Tech ID: 34657 / UC Case 2026-121-0

## PATENT STATUS

Patent Pending

## BRIEF DESCRIPTION

Electronic (also called chemiresistive) gas sensors based on semiconducting metal oxides (SMOX) are widely used to detect hazardous gases for environmental, health and safety monitoring, including industrial processes and air quality assessment, among others. However, volatile siloxanes, which are organosilicon compounds prevalent in personal care products and other consumer materials, can severely degrade the performance of these sensors (so-called siloxane poisoning), eventually leading to their failure.

To address this vulnerability, UC Berkeley researchers have developed an effective mitigation strategy that applies an ultra thin protective layer over the sensing material. This barrier effectively suppresses siloxane induced deactivation by altering the adsorption energetics and reaction pathways of the interferents. The interfacial electronic interactions and protection mechanisms have been comprehensively validated through density functional theory calculations and rigorous material characterization techniques, offering a robust framework for designing resilient environmental sensors.

## SUGGESTED USES

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Industrial safety monitors that track toxic gas leaks in chemical processing plants without experiencing signal degradation from ambient siloxanes.

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Environmental air quality networks deployed in urban regions to maintain highly stable long term baseline measurements despite the presence of consumer product emissions.

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Automotive emission tracking devices and cabin air filtration systems that require consistent sensor accuracy under continuous operational exposure.

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Indoor air quality monitoring hardware designed for smart homes to precisely detect volatile organic compounds without interference from household cleaning agents.

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Confined space safety apparatus used in aerospace and defense operations where sensor fouling from outgassing materials must be completely prevented.

## ADVANTAGES

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## CONTACT

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## INVENTORS

» Maboudian, Roya

## OTHER INFORMATION

**CATEGORIZED AS**

» **Environment**

» Sensing

» **Sensors & Instrumentation**

» Environmental Sensors

**RELATED CASES**

2026-121-0

Provides exceptional resilience against siloxane induced deactivation to significantly extend the functional lifespan of chemiresistive sensing devices.

»

Utilizes atomic layer deposition to create a precisely controlled ultra thin $SiO_2$ coating that protects the underlying material without blocking target gas diffusion.

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Preserves critical gas sensing characteristics including baseline stability, high selectivity, and sensitivity under pervasive exposure to organosilicon compounds.

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Supported by rigorous density functional theory calculations that clarify interfacial electronic charge transfer and adsorption energetics for predictable performance.

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Offers versatile design principles that can be readily applied to various $SnO_2$ architectures and other semiconducting metal oxide configurations.

## RELATED MATERIALS

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