

A Review on Recent Progress, Challenges and Future Perspectives of Indium Oxide-Based Gas Sensors.

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Abstract: *With rapid industrial growth and urbanization, the release of harmful gases has become a serious threat to human health and the environment. To address this, highly sensitive and selective gas sensors are needed. Indium oxide (In_2O_3) has gained significant attention due to its stability and effectiveness in detecting various gases. This review focuses on the latest advancements in In_2O_3 -based gas sensors over the past five years, particularly their response to pollutants like VOCs, NO_x , CO, O_3 , NH_3 , and SO_2 . Among the different synthesis methods, the hydrothermal approach has been widely used for fabricating these sensors. However, a major challenge is that most In_2O_3 sensors require high operating temperatures, limiting their long-term stability and commercialization. To overcome this, researchers have explored noble metal-doped In_2O_3 sensors, which show promise for room-temperature operation. Future developments aim to create intelligent, self-powered gas sensors integrated with smartphones and IoT systems. With Bluetooth-enabled In_2O_3 sensors, gas concentrations can be monitored wirelessly without an external power source. This advancement could enhance applications in wireless signal detection, machine learning-based data processing, and smart gas sensing technology.*

Keywords: In_2O_3 , Gas sensors, Internet of things, Wireless detection Smartphones

