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A high throughput platform screening of ppb-level sensitive materials for hazardous gases

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HIGHLIGHTS

1. A high-throughput screening platform for screening metal oxide (MOX) gas sensing materials with high sensitivity was designed and established. It consisted of gas-sensing film parallel synthesis platform and high-throughput gas-sensing unmanned testing platform.
2. Thirty-one SnO₂ sensing films with different metal ions surface modified and an intrinsic SnO₂ film were parallel deposited with this platform efficiently.
3. Ir-modified and Ag-modified SnO₂ sensing films obtained high sensitivity to formaldehyde, benzene, toluene and xylene under temperature programmed cooling. The detection limits to formaldehyde, benzene, toluene and xylene were 20 ppb, meeting the need of IAQS of China (GB/T 18883-2002).
4. SnO₂ modified with Ir and Ag respectively, which have high performance were screened out. The dynamic responses of Ir-modified SnO₂ to formaldehyde and xylene were bigger than that to benzene and toluene. While Ag-modified SnO₂ was more sensitive to toluene and xylene.

Abstract:

Hazardous gases such as formaldehyde, benzene, toluene and xylene are harmful to human health. Utilizing sensors with extraordinary gas sensing performances to detect these gases is essential to air quality monitoring. According to indoor air quality standard of China (IAQS, GB/T 18883-2002), the detection limits for formaldehyde, benzene, toluene and xylene are 0.075 ppm, 0.034 ppm, 0.047 ppm, 0.042 ppm respectively. While the detection limits of current commercial metal oxide (MOX) gas sensors to these four gases are approximately 1 ppm or more, which does not meet the IAQS.

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