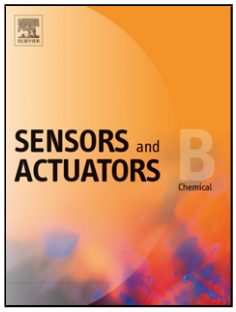

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NO_x sensitivity of conductometric $In(OH)_3$ sensors operated at room temperature and transition from p- to n- type conduction

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Highlights

- The obtained porous $In(OH)_3$ exhibited p-type response to testing gases.
- $In(OH)_3$ shows p- to n-type switch induced by 10000 ppm NO_x at room temperature.
- The sensitivity of IISH to 10 ppb NO_x is 27.5.
- The mechanism of n-p-n conductivity conversion is verified by XPS and in situ DRIFT.

Abstract

Non-single crystal cubic $In(OH)_3$ with porous structure was synthesized by hydrothermal method. It is well known that $In(OH)_3$ is an n-type semiconductor, but freshly prepared $In(OH)_3$ displays p-type conduction behavior according to response towards testing gases. Furthermore, the $In(OH)_3$ sensor displays n-type conduction behavior after it was induced by the high concentration of NO_x and the induced $In(OH)_3$ sensor is named IIHS. The gas sensing properties of the IIHS with the concentration of NO_x ranging from 100 ppm to 10 ppb were investigated at room temperature, and the IIHS displayed numerous advantages in the aspects of great reliability and high sensitivity. The mechanism of n-p-n conductivity conversion process of $In(OH)_3$ was investigated and proposed by XPS and in situ DRIFT.