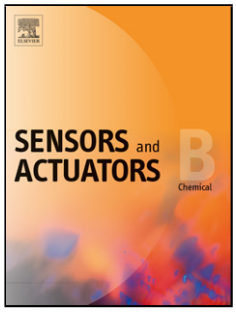

Title: Highly sensitive acetone sensors based on flame-spray-made La_2O_3-doped SnO_2 nanoparticulate thick films

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PII: S0925-4005(18)30267-3
DOI: https://doi.org/10.1016/j.snb.2018.01.238
Reference: SNB 24087

To appear in: *Sensors and Actuators B*

Received date: 13-10-2017
Revised date: 17-1-2018
Accepted date: 31-1-2018

Please cite this article as: { https://doi.org/

<AT>Highly sensitive acetone sensors based on flame-spray-made La_2O_3-doped SnO_2 nanoparticulate thick films

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<ABS-Head><ABS-HEAD>Graphical abstract

<ABS-P>

<ABS-P><xps:span class="xps_Image">fx1</xps:span>

<ABS-HEAD>Highlights► Flame-made SnO_2 nanoparticles were incorporated with 0–2 wt% La. ► Structural analyses suggested that La_2O_3 crystallites were soluted in SnO_2 matrix. ► Response to 400 ppm acetone at 350°C was greatly enhanced from 8.2 to 3,626 with 0.5 wt% La. ► The optimal sensor exhibited high acetone selectivity against SO_2, H_2S, NO_2, C_6H_6, C_7H_8, C_8H_{10} and CH_2O. ► The results were attributed to distributed *p-n* heterjunctions, strong La_2O_3 basicity and reduced structural sizes.

<ABS-HEAD>ABSTRACT

<ABS-P>In the present work, flame-spray-made La_2O_3-doped SnO_2 nanoparticles with 0.1−2 wt% La contents were systematically studied for acetone detection. The particle and sensing film properties were characterized by X-ray diffraction, nitrogen adsorption, electron microscopy, energy dispersive X-ray spectroscopy and X-ray photoelectron spectroscopy. The sensing films were tested towards 0.1−400 ppm acetone at operating temperatures ranging from 150 to 400°C in dry air. Gas-sensing results demonstrated that the SnO_2 sensing film with the optimal La content of 0.5 wt% exhibited a very high response of 3,626 toward 400 ppm acetone with a short response time of 2.8 s at the optimal operating temperature of 350°C. Moreover, the sensors displayed high acetone selectivity against SO_2, H_2S, NO_2, C_6H_6, C_7H_8, C_8H_{10} and CH_2O. Therefore, the La_2O_3-doped SnO_2 sensors are promising for sensitive and selective detections of acetone at low concentrations.