DOI 10.5162/IMCS2018/P1GS.10

Improving the Gas Sensing Performance Based on Ordered Mesoporous Pd/SnO_2 Sensor

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Abstract:

Ordered mesoporous Pd/SnO_2 nanomaterials with different amounts of Pd (0.1, 0.2, 0.5 and 1 wt%) have been successfully synthesized by hard template method using the hexagonal mesoporous SBA-15 as a template. Low angle XRD patterns of pure mesoporous SnO_2 and Pd/SnO_2 exhibit well-resolved diffraction peaks, implying their ordered mesostructure. TEM image of 0.2% Pd/SnO_2 shows a long-range periodic order mesochannel in agreement with XRD result. A study on their gas sensing properties for H_2 reveals that the sensor utilizing Pd/SnO_2 displays much higher sensitivity to H_2 compared to those based on pure mesoporous SnO_2. The maximum response of 0.2% Pd/SnO_2 sensor reaches to 151 at 250℃ to 1000 ppm H_2, which is 10 times larger than that of the pure SnO_2 sensor (at 300 ℃). The outstanding performance of the mesoporous Pd/SnO_2 sensor arises from the ordered mesostructure, large surface area and well dispersion of Pd, which lead to highly effective surface reaction between gas molecules and the chemically adsorbed oxygen on the SnO_2 surface.

Key words: gas sensor, hydrogen, hard template, tin dioxide, Pd

Materials characterization and gas sensing performances:

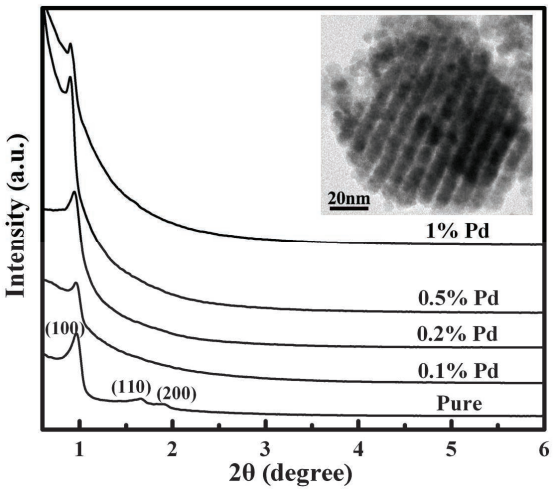

Fig. 1. Low-angle XRD patterns of mesoporous Pd/SnO_2 and TEM (inset) of 0.2% Pd/SnO_2.

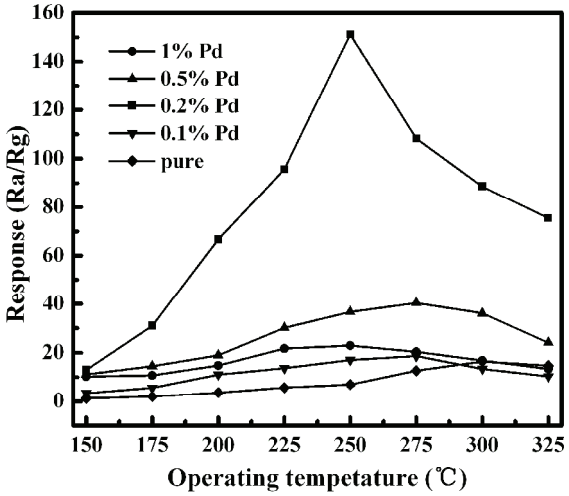

Fig. 2. Response of the sensors to 1000 ppm H_2 at different temperatures.

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This work was supported by Natural Science Foundation of China (No.61603059, 21605006), Jilin Province Science and Technology Development Plan Program (No. 20160520088JH) and Science and Technology Research Program of Education Department of Jilin Province (No. 2016318)