NF3-04

Mesoporous tin oxide gas-sensor with ultra-high gas sensitivity

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Numerous metal oxide semiconductor materials, such as SnO_2, In_2O_3, WO_3, ZnO, TiO_2 and so on, have been reported to be usable as gas sensors. Especially, the SnO_2 has intensively studied and utilized to gas-sensing material, because of its relatively high sensitivity and low cost. However, there are several drawbacks for the application. For example, semiconductor gas-sensors involve long response and recovery time, and the sensitivity may be reduced by the change of surface structures during the applications. According to the principle of gas-sensing using metal oxide semiconductors, the surface area of metal oxide is very important factor for increasing sensitivity because the resistance change is detected through the surface reaction. In the present work, we have prepared mesoporous SnO_2 with high surface area (about 117 m^2/g) using nano-replication method. The mesoporous SnO_2 exhibits well-developed and well-aligned porous structure. The mesoporous SnO_2 has been utilized for the detection of ethanol, and the results indicate that the the present mesoporous SnO_2 is a promising material to achieve ultra-high gas sensitivity as well as ultra-low detection limit.