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Ultra-sensitive and highly selective H2 sensors based on FSP-made Rh-substituted SnO2 sensing films

In this research, SnO2 nanoparticles doped with 0.1-2 wt% rhodium (Rh) were synthesized by flame spray pyrolysis (FSP) and systematically investigated for H2-sensing applications. From X-ray and electron microscopic characterizations, SnO2 nanostructures exhibited spheroidal morphology with polycrystalline tetragonal SnO2 phase and Rh might form solid solution with SnO2 lattice. The sensing films were prepared by spin coating technique and their gas sensing performances were studied at the operating temperatures ranging from 100-350℃ in dry air. Gas-sensing measurements showed that SnO2 sensing films with the optimal Rh doping level of 0.2 wt% exhibited an ultra-high response of ˜22,170, which was more than three orders of magnitude higher than that of undoped one, and a short response time of 6 s towards 30,000 ppm H2 at an optimum operating temperature of 300℃. In addition, the optimal Rhdoped SnO2 sensor displayed high H2 selectivity against NO2, SO2, C2H4,C3H6O, CH4, H2S and CO. Thus, Rh-doped SnO2 nanoparticulate films are promising candidates for hydrogen-sensing applications.

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