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WO_3-SnO_2 Sensors for Selective Detection of Volatile Organic Compounds for Breath Analysis

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Abstract : A simple, single-step and one-pot hydrothermal method was employed to synthesize WO_3-SnO_2 mixed nanostructured metal oxides at 200°C in 12h. The SnO_2 nanoparticles were found to be uniformly decorated on the WO_3 nanoplates. Though it is widely known that noble metals such as Pt, Pd doping or decoration on metal oxides improve the sensing response and sensitivity, we varied the SnO_2 concentration in the WO_3-SnO_2 mixed oxide and demonstrated their performance in ammonia, ethanol and acetone sensing. The sensing performance of WO_3-(x)SnO_2 [x = 0.27, 0.54, 1.08] mixed nanostructured oxides was found to be not only superior to that of pristine oxides but also higher/better than that of reported noble metal-based sensors. The sensing properties (selectivity, limit of detection, response and recovery times) are measured as a function of operating temperature (150-350°C). In particular, the gas selectivity is found to be highly temperature-dependent with optimum performance obtained at 200°C, 300°C and 350°C for ammonia, ethanol, and acetone, respectively. The present results on cost effective WO_3-SnO_2 sensors can find potential application in human breath analysis by noninvasive detection.

Keywords : gas sensing, mixed oxides, nanoplates, ammonia, ethanol, acetone
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