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A classification and ranking system on the H2 gas sensing capabilities of nanomaterials based on proposed coefficients of sensor performance and sensor efficiency equations

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Abstract

A coefficient of performance is defined based on the traditional definitions of response, S, of a chemoresistive sensing material to a specific gas from resistance–time data. The new definition not only considers the $S_{response}$ and $S_{recovery}$ but also the temperature, T, and the relative humidity, H, at which the sensor operates and the response time, _res, and recovery time, _rec. Resistance–time data at various temperatures in a H_2 atmosphere for six samples of different materials, including WO_3 nanoparticles, SnO_2 nanoparticles, SnO_2 nanoparticles mixed with carbon nanotubes, TiO_2 nanorods, TiO_2 nanotubes and VO_2 nanobelts, are presented in this report. The VO_2 nanobelts were the best sensing materials when these materials were ranked according to the temperatures at which they operate; however, the SnO_2 nanoparticles are the superior sensing materials when they are ranked by the defined coefficient of performance.