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## **ZnO Hydrogen Nanoscale Sensors**

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### **Abstract**

Hydrogen has the potential to play an important role in energy and automobile industries in our society. Being an explosive gas, hydrogen is also a colorless and odorless gas; therefore, there is a great need to develop hydrogen sensors for public safety reason. Zinc oxide (ZnO) has been used as hydrogen sensors for a number of years. Here we review the synthesis and fabrication of pure and doped ZnO nanoscaled materials for hydrogen sensing applications. First, we will describe both gas-phase growth and solution growth methods. Next, we describe the fabrication of nanoscaled sensors based on ZnO nanostructures and their characteristics. Several methods that were employed to enhance the nanosensor performance, such as increasing surface volume ratio, impurity doping, and surface functionalization, will be discussed as well. The effect of impurity doping on the gas response of ZnO to hydrogen will be discussed. Doped ZnO nanosystem demonstrates an enhanced gas response for the detection of hydrogen at room temperature compared to previously reported nanosensors based on pure single ZnO nanowire (NW) or multiple NWs. Finally, the sensing mechanisms will be discussed, and major conclusions and future directions will be given.