TiO_2/ZnO COLUMNAR HETEROSTRUCTURES

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Researchers from different countries are looking for the best ways to prevent pollution by detecting various species at low concentrations in environment. Different heterostructure-based devices and technical approaches are investigated to detect the gases polluting the atmosphere. In this work we synthesized TiO_2/ZnO columnar films and studied their characteristics, including the sensor structures based on zinc oxide doped with different impurities. The effects of nano-heterogeneous formation of non-planar junctions of titania (TiO_2) and zinc oxides on sensory selectivity are also investigated. The properties of these materials were measured using XRD, XPS, EDX, SEM and electrical techniques. These sensor structures were tested at low concentrations of hydrogen and ethanol. To tune and improve the selectivity of the gases, a thin layer of titania was sprayed. It was studied the response to different gases and volatile organic compounds, in order to determine the best sensor material, it was also determined the lowest operating temperature. In the paper, the dynamic gas behaviors are presented to confirm that the developed sensor has the same gas response after a certain time interval, and then the response and recovery times have been calculated after the test gas was applied. The results are important for the further development of oxide semiconductors for sensory devices and to have own cost-efficient technologies for device fabrication.

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