Synthesis of ZnO based gas sensing fiber material by electrospinning technique for detecting hazardous gases analysis

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In recent years air pollution has risen dramatically, therefore detecting hazardous gases is becoming increasingly important. Hazardous gas detection is critical for system and process control, as well as safety monitoring and environmental protection. Nowadays metal oxide-based gas sensors are in high demand due to these advantages such as being affordable to manufacture, easy to miniaturize, durable, dependable, and can be made to work in a variety of environments. Among metal oxides, zinc oxide (ZnO) is an eminent semiconductor material owing to its good electrical, mechanical, and unique optical properties. ZnO has a wide direct bandgap width (3.37 eV), a huge excitation binding energy (60 meV), as well as various distinctive qualities, including high electron mobility and transparency. This research is devoted to the development of gas sensors using the electrospinning technique to fabricate ZnO-based gas sensing material. Fiber spinning parameters were established and under these conditions, ZnO-based fibers were collected at the electrode. Finally obtained gas sensing material was morphologically and structurally characterized by scanning electron microscopy (SEM), transmission electron microscopy (TEM), Fourier-transform

infrared spectroscopy (FTIR), thermogravimetric analysis (TGA), and X-ray diffraction (XRD) analysis. In addition, electrical and gas sensing measurements were performed for the obtained samples. ZnO-based fiber gas sensing with precise control of size and morphology can be fabricated using the electrospinning method. I-V and gas measurements of the gas sensing materials from room to 100 °C showed positive responses.

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