

عنوان مقاله:

Investigations on $\text{TiO}_2\text{-NiO@In}_2\text{O}_3$ Nanocomposite Thin Films (NCTFs) for Gas Sensing: Synthesis, Physical Characterization, and Detection of NO_2 and H_2S Gas Sensors

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خلاصه مقاله:

The spray pyrolysis technique is a versatile and cost-effective method for producing $\text{TiO}_2\text{-NiO@In}_2\text{O}_3$ NCTFs on glass substrates with varying molar ratios. NCTFs have been studied for gas-sensing applications due to their excellent sensing properties. The films' structural, morphological, and gas-sensing characteristics were analyzed. The XRD analysis indicates that the NCTFs are polycrystalline, meaning that they are made up of many small crystals. The crystals are oriented in a random fashion, which is why the XRD pattern is broad. The anatase phase of TiO_2 is a tetragonal crystal structure. The NiO and In_2O_3 phases are both cubic crystal structures. The presence of nanostructure cubic phases indicates that the nanoparticles in the films are small enough to significantly affect the crystal structure of the films. Scanning electron microscopy images showed surface homogeneity, with small granular grains of nanostructures without any cracks. The gas sensor created using the prepared samples showed high sensitivity to NO_2 and H_2S gases, and its sensitivity was measured at different operation temperatures, along with response and recovery times. The optical properties of In_2O_3 are affected by the addition of TiO_2 and NiO impurities. The In_2O_3 transmittance increases as the NiO ratio increases and the TiO_2 ratio decreases.

کلمات کلیدی:

$\text{TiO}_2\text{-NiO@In}_2\text{O}_3$ NCTFs /glass substrate, crystal structure, High sensitivity, NO_2 and H_2S gas sensors, Optical properties

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