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A comparative study of different rare-earth (Gd, Nd, and Sm) metals doped ZnO thin films and its room temperature ammonia gas sensor activity: Synthesis, characterization, and investigation on the impact of dopant

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Abstract

Zinc oxide and rare earth (Gd, Nd, and Sm) doped zinc oxide thin film has been synthesized chemically by facile and cost-effective SILAR method. The impact of rare-earth doping on structural, morphological, and optical properties of ZnO films has been investigated using various characterization techniques. The stylus profiler method is employed to find the thickness of the films. The doping of rare earth elements reduces the thickness of the films. The XRD and SEM results suggest that the rare-earth metal is successfully incorporated into the ZnO lattice. The elemental mapping and EDS results show that homogeneous scatter

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of zinc (Zn), oxygen (O), gadolinium (Gd), neodymium (Nd), and samarium (Sm) compounds are found in the doped films. The transmission and bandgap of the films are enhanced due to doping. The doped ZnO films have exhibited significant enhancement in ammonia gas sensors at room temperature. Nd doping is effective than the Sm doped ZnO and Gd doped ZnO to sense the ammonia in terms of recovery time, response time, and sensitivity. © 2021 Elsevier B.V.

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Adsorption; Ammonia; Bandgap; Diffraction; Response-recovery time; Stability

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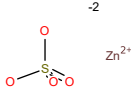
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