An investigation on GaN/ porous-Si NO_2 gas sensor fabricated by pulsed laser ablation in liquid

Abstract - Pulsed-laser ablation in liquid was used to prepare GaN nanostructure. The P-type GaN nanostructure was deposited onto the porous-silicon substrate through the drop-casting method for NO2 gas-sensor fabrication. Ablation was performed in ethanol using two laser wavelengths, namely, 532 and 1064 nm. The XRD pattern showed a high and sharp peak at 2θ= 29.49°, indicating enhanced GaN formation using a 532 nm laser wavelength. AFM and FESEM analyses confirmed increased GaN grain growth at the same wavelength. The optical reflectance of the GaN sample showed higher reflectance at 532 nm than at 1064 nm. The optical-energy bandgap was more elevated at 532 nm than at 1064 nm. Photoluminescence analysis revealed that the 532 nm sample had a higher-intensity peak than the 1064 nm one. Device-performance studies showed the most enhanced sensor response (158.49%), highest sensitivity (2.109 ppm), and best response time (13.5 s) at 250 °C for the sample prepared using 532 nm laser wavelength.

Corresponding Author: Prof. Ts. Dr. Uda Hashim

Corresponding Author's Email: uda@unimap.edu.my

Link to Publication: https://doi.org/10.1016/j.snb.2022.132163