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# An enhanced optoelectronic $NO_2$ gas sensors based on direct growth ZnO nanowalls in situ on porous rGO

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**Abstract:** ZnO nanowalls were grown in situ on the surface of porous reduced graphene oxide (PG) films using spray, thermal reduction and facile solution method in this work. The products were characterized by powder X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), Raman spectroscopy. The results showed that the highly developed interconnected 3-D ZnO nanowall networks were anchored homogeneously on the surface of PG films to construct 3D ZnO/PG hybrid nanocomposites. This 3D hybrid nanostructure provided many channels for gas diffusion. The fabricated sensor based on ZnO/PG composites showed good photo sensing response (7.4) to 365nm UV light and an enhanced gas sensitivity (35.31) to 50 ppm $NO_2$ with irradiation of UV light of 1.2mW/cm$^2$ in the air at room temperature, which was 2.24 fold higher than that of pure ZnO, and the response-recovery times were (~ 37s, and 2s) when exposed to 50 ppm $NO_2$. The optoelectronic gas sensing mechanisms of ZnO/PG composites were proposed in detail to understand the effect of UV irradiation in the $NO_2$ detection process.

Key Words: ZnO nanowalls, porous rGO, UV light, optoelectronic gas sensor, $NO_2$

## 1. Introduction

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