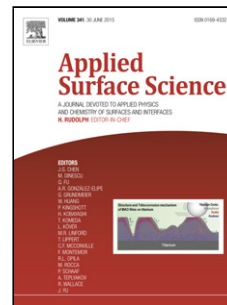


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# Effect of annealing on chemical, structural and electrical properties of Au/Gd<sub>2</sub>O<sub>3</sub>/n-GaN heterostructure with a high-k rare-earth oxide interlayer

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## Highlights

- Chemical and structural properties of Gd<sub>2</sub>O<sub>3</sub>/n-GaN heterostructure are investigated.
- Au/Gd<sub>2</sub>O<sub>3</sub>/n-GaN heterostructure exhibited excellent rectifying nature.
- Higher BH is achieved for the heterostructure compared to the Schottky structure.
- The overall surface morphology of the Gd<sub>2</sub>O<sub>3</sub> film on n-type GaN is considerably smooth.

## ABSTRACT

The chemical, structural and electrical characteristics of a fabricated Au/Gd<sub>2</sub>O<sub>3</sub>/n-GaN heterostructure with gadolinium oxide (Gd<sub>2</sub>O<sub>3</sub>) as an insulating layer are explored by XPS, XRD and I-V techniques at room temperature and 400 °C annealing. XPS and XRD results reveal that the Gd<sub>2</sub>O<sub>3</sub> films are formed at the interface. The electrical results of heterostructure are correlated with the conventional Au/n-GaN Schottky structure results. The as-deposited and 400 °C annealed heterostructures exhibited excellent rectifying behavior and very low reverse leakage current compared to the Schottky structure. Higher barrier height (BH) and on/off ratio are achieved for the heterostructure compared to the Schottky structure, which has led the barrier height modified by Gd<sub>2</sub>O<sub>3</sub> insulating layer. Also, the results indicate that the BH slightly increases for the 400 °C annealed heterostructures. Further, the BH, ideality factor and series resistance are evaluated by Cheung's, Norde functions and  $\Psi_S$ -V plot and the values are found to

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