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Controlled Modification of Ga_2O_3 Interfaces for Photovoltaic and Photoconductive UV Detectors

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Gallium Oxide (Ga_2O_3) is an ultra-wide bandgap semiconductor with a strong potential for UV “solar-blind” photodetectors. The objective of this work is to investigate the controlled modification of Ga_2O_3 /metal interfaces inserted in a metal-semiconductor-metal (MSM) structure by ion implantation and thermal annealing. The control of the electrical contacts allows MSM photodetectors to operate in different modes, photovoltaic and photoconductive, depending if contacts are Ohmic or Schottky.

Ga_2O_3 thin films will be deposited by RF magnetron sputtering and the effect of different values of power, pressure and deposition time will be studied. Doping of these films with Sn donors during growth or by ion implantation will also be investigated. Subsequently, the previously mentioned contacts will be made by using different metals (Ni, Ti and Pt) deposited on the semiconductor by magnetron sputtering. Then, post-deposition treatment processes, such as thermal annealing are applied in order to modify the electrical, optical and structural properties of the MS interfaces. These properties will be characterized by different experimental techniques and the final device performance will be assessed by the measurement of variables associated with the photodetectors such as (responsivity, detectivity, external quantum efficiency, photo-to-dark current ratio and the response time).

Field of Research/Work

Condensed Matter and Materials

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