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Solar-Blind Ni-Schottky Photodetector Based on MOCVD Grown $ZnGa_2O_4$

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Abstract : This study presents a comprehensive analysis of the design, fabrication, and performance evaluation of a solar-blind Schottky photodetector based on $ZnGa_2O_4$ grown via MOCVD, utilizing Ni/Au as the Schottky electrode. $ZnGa_2O_4$, with its wide bandgap of 5.2 eV, is well-suited for high-performance solar-blind photodetection applications. The photodetector demonstrates an impressive responsivity of 280 A/W, indicating its exceptional sensitivity within the solar-blind ultraviolet band. One of the device's notable attributes is its high rejection ratio of 10^5, which effectively filters out unwanted background signals, enhancing its reliability in various environments. The photodetector also boasts a photodetector responsivity contrast ratio (PDCR) of 10^7, showcasing its ability to detect even minor changes in incident UV light. Additionally, the device features an outstanding detective of 10^{18} Jones, underscoring its capability to precisely detect faint UV signals. It exhibits a fast response time of 80 ms and an ON/OFF ratio of 10^5, making it suitable for real-time UV sensing applications. The noise-equivalent power (NEP) of 10^-17 W/Hz further highlights its efficiency in detecting low-intensity UV signals. The photodetector also achieves a high forward-to-backward current rejection ratio of 10^6, ensuring high selectivity. Furthermore, the device maintains an extremely low dark current of approximately 0.1 pA. These findings position the $ZnGa_2O_4$-based Schottky photodetector as a leading candidate for solar-blind UV detection applications. It offers a compelling combination of sensitivity, selectivity, and operational efficiency, making it a highly promising tool for environments requiring precise and reliable UV detection.

Keywords : wideband gap, solar blind photodetector, MOCVD, zinc gallate
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