Effect of Epitaxial Layer Thickness on the Electrical Properties of SiC Detectors

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Abstract. Silicon carbide (4H-SiC) is a promising material for radiation detectors in harsh environments due to its thermal stability and radiation hardness. Understanding the influence of epitaxial layer thickness on detector performance is crucial for optimizing device design and achieving reliable operation under extreme conditions. This study investigates Schottky-type SiC detectors with epitaxial layers of 25, 50, 80, and 100 µm thickness. Electrical characterization via capacitance-voltage (CV) and current-voltage (IV) measurements were performed to assess the impact of epitaxial thickness on leakage current, full depletion voltage, and doping concentration of detectors. The results indicate that detectors with 25, 50, and 80 µm thick epitaxial layers exhibit more favourable electrical characteristics compared to the 100 µm sample, which shows higher doping concentration and requires significantly higher operating voltages for full depletion, leading to increased leakage current.