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Effect of Low-Energy Proton Radiation on the Degradation of Silicon Carbide Schottky Diodes

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Abstract Silicon carbide (SiC) Schottky diodes are gaining traction for their potential in high-voltage, high-temperature, and radiation-resistant applications. While superior to traditional silicon (Si) diodes, their radiation hardness requires further exploration, particularly at lower energies. Although high-energy radiation undoubtedly degrades devices, understanding the impact of lower-energy radiation is crucial for real-world applications. This study employed 8 MeV proton radiation, considered relatively low energy in radiation physics, to investigate the response of SiC Schottky diodes. Interestingly, the irradiated devices displayed a slight decrease in reverse leakage current, indicating improved blocking ability. Encouragingly, both forward current and capacitance remained relatively unaffected, with a minor change in the ideality factor. Microscopy confirmed these findings by revealing no surface-level defects or leakage current hotspots, solidifying the exceptional resilience of SiC Schottky diodes to even lower-energy radiation.

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