



Contribution ID: 318

Type: Oral Presentation

W2 Silicon Carbide Nuclear Radiation Detectors: Progress, Limitations and Future Directions

Monday, June 9, 2025 10:30 AM (45 minutes)

Silicon Carbide (SiC) semiconductor radiation detectors offer many advantages for measurement applications in high-temperature and high-radiation environments. In addition to possessing many of the advantages of conventional Si radiation detectors, the relatively wide band gap for SiC (3.27 eV at 300 °C for 4H-SiC) leads to detector leakage currents that are more than three orders of magnitude lower than Si at room temperature, and the leakage currents remain low at elevated temperatures allowing the detectors to operate reliably at temperatures up to 700 °C and higher. Furthermore, SiC detectors have been shown to perform well after exposure to very high gamma-ray, charged-particle and neutron cumulative doses.

Although SiC radiation detectors were first demonstrated more than 65 years ago in 1959, the availability

Although SiC materials technology has advanced rapidly and significantly, many limitations remain for cont

The present paper will review the history and progress of SiC detector development, discuss materials and

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Session Classification: Workshop N°2: Novel perspectives for radiation detection materials