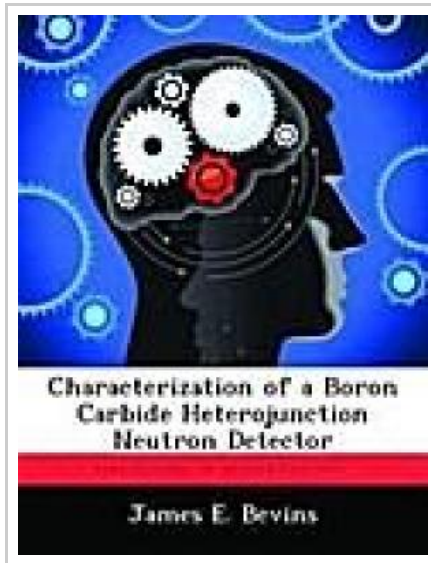




Characterization of a Boron Carbide Heterojunction Neutron Detector

By James E. Bevins

Biblioscholar Okt 2012, 2012. Taschenbuch. Book Condition: Neu. 246x189x12 mm. This item is printed on demand - Print on Demand Neuware - New methods for neutron detection have become an important area of research in support of national security objectives. In support of this effort, p-type B5C on n-type Si heterojunction diodes have been built and tested. This research sought to optimize the boron carbide (BC) diode by coupling the nuclear physics modeling capability of GEANT4 and TRIM with the semiconductor device simulation tools. Through an iterative modeling process of controllable parameters, optimal device construction was determined such detection efficiency and charge collection were optimized. This allows an estimation of expected charge collection and efficiency given a set of operating parameters that include: silicon resistivity, BC resistivity, BC thickness, silicon thickness, applied bias, and collection contact. Charge collection was maximized with high bias operation of thin BC layers on thin silicon substrates of low resistivity ($<10^{-4}$ cm), while the capture efficiency was maximized for thicker BC layers. Additionally, the effects of neutron damage on BC diodes were studied to determine damage thresholds and resulting device performance and lifetime. The major limitation found for device performance was the increase in the...



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