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SiC detectors for neutron monitoring

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Abstract

Semiconductor detectors equipped with a converter like ^{6}LiF or ^{10}B can currently be considered a very interesting alternative to conventional neutron detectors, especially because of their compactness and reliability. The materials for the detection of the ions produced in the converter are generally either Si or GaAs. SiC detectors presented in this work are completely new devices which are proved to be very suitable for neutron detection, dosimetry and beam monitoring. Their capability to withstand high radiation doses should largely overcome the performances of Si and GaAs; moreover, because of the lower Z value, gamma-ray discrimination turns out to be more efficient. In this work, the results obtained with a series of large-area epitaxial SiC Schottky barrier detectors will be presented and discussed.

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Keywords: Radiation detector; Neutron detection; Boron neutron capture therapy; Epitaxial silicon carbide; Neutron beam monitoring; Electrical characterization

1. Introduction

In recent years there has been an increasing demand for new types of neutron detectors and dosemeters, to be used in applications such as detection of nuclear weapons, fissile materials or drugs inspections at customs and airports, boron neutron capture therapy (BNCT), etc. For these applications it is necessary to dispose off small, portable and reliable neutron detectors.

Semiconductor detectors [1–4] exhibit remarkable advantages: they are small, simple and can work at low bias voltages or even in the photovoltaic mode. Other characteristics are advisable: a good discrimination ability against gamma

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