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# Development of 2D GaN and 3D SiC detectors

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Wide band gap semiconductors, such as GaN and SiC, have exhibited notable advantages, when they are applied as a nuclear radiation detector in a harsh environment of high temperature or strong radiation field. Recently a GaN alpha-particle detector of p-i-n structure was fabricated on a sapphire substrate in this article. The intrinsic layer of the detector was isoelectronic Al-doped GaN with the thickness of 10 μm. The leakage current of the detector remained below 10 pA when the reverse voltage increased from 0 to 40 V, which proved that it had a better crystal quality than the detector based on undoped i-GaN layer, of which the dark current was 10 nA at −40 V. The i-GaN layer would be fully depleted at −48 V. With the remarkable improvement of electrical properties, the charge collection efficiency (CCE) of the full depleted detector in this article was as high as 99%, while the energy resolution was about 4%. Further, in order to obtain better time resolution characteristics, the 3D SiC detector was developed using a laser drilling method. The SiC single crystal was about 350 microns, and the diameter of the holes are 50 microns and 100 microns, respectively. Then Indium was filled into the holes. The basic electrical characteristics have been mastered by I-V and C-V tests.

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