

Study of GaN X-ray detector

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Ge detectors are widely used as X/γ detectors, but they need to be cooled by liquid nitrogen, so semiconductor detectors that can operate at room temperature are being studied as an alternative. Typical materials are CdTe and TlBr, which have the advantages of room temperature operation and higher stopping power than Ge. However, compared to Ge, which has been used in practical applications for a long time, the fabrication processes such as crystal growth, shaping, and electrode formation are still under development, which hinders mass production. In this paper, we propose the use of GaN as a new semiconductor detector material.

GaN has a wide band gap and can be operated at room temperature, and has a stopping power equivalent to that of Ge. GaN has been developed and put to practical use in optical and power devices, and it is expected that the availability of high-quality crystals and the establishment of processing processes for radiation detectors will become easier in the future. On the other hand, there is a lack of sufficient experimental data on GaN as a radiation detector.

In this study, in order to demonstrate the X-ray detectability of GaN, we fabricated a prototype GaN detector with a pn diode structure and conducted X-ray irradiation experiments, in which X-rays were generated by an X-ray tube system and irradiated onto a GaN diode, and the response current according to the X-ray intensity was observed.

Topics

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