

GaN Semiconductor X-ray Detectors

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CdTe is an excellent material for semiconductor X-ray detectors that can be operated at room temperature, but its K-edge around 30keV results in a low attenuation coefficient in the lower energy region. We propose gallium nitride (GaN) as a new semiconductor detector material that has a higher attenuation coefficient than CdTe in the low energy region of approximately 10 to 26keV and can be operated at room temperature.

Despite these promising properties, sufficient experimental data as a radiation detector have not been obtained. In this study, we first calculated the probability of X-ray detection with respect to the thickness of the sensitive layer of the detector. As a result, we fabricated a vertical pn diode and pin diode detector because it is difficult to realize a horizontal structure. I-V measurements were performed to verify whether the diode structure was formed, and the diode structure was confirmed. This confirmed that GaN has the potential to be used as a semiconductor detector. Next, X-ray response measurements were performed to verify the sensitivity of the detector to X-rays. As a result, the detection current increased with the X-ray dose rate. Therefore, we believe that imaging using X-rays is feasible.

Topics

Session A. Physics of condensed matter and spectroscopy

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