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Thermal Stability of Electrical and Spectral Properties of CdTe X-ray Detectors with a Schottky Barrier and Laser Doping p-n Junction

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CdTe has been used as an X-ray image detector because of its high sensitivity, energy and spatial resolution, and room temperature operation. In order to build image detectors, it is necessary to bond CdTe pixel elements to a signal-reading LSI, and it is necessary to maintain the performance even if it is added heat treatment in order to use an efficient method for making contacts with the substrate. The thermal stability of two types of In/CdTe/Au diode detectors with a p-n junction or a Schottky barrier are examined. p-n junctions were formed by by irradiating a laser beam onto the interface between the indium (In) metal electrode and CdTe and doping In atoms into CdTe. The Schottky barrier is formed at the interface between the p-type CdTe semiconductor and the In metal electrode. In the case of the p-n junction CdTe detector, the I-V characteristics did not deteriorate even after adding heat treatment at temperatures up to 300 ℃ above the melting point of In (156 ℃), and the γ-ray detection efficiency and energy resolution did not change. On the other hand, in the case of the Schottky barrier CdTe detector, the I-V characteristics and the spectral characteristics deteriorated with increasing temperature and the sensitivity to γ rays was lost.The thermal stability of the CdTe detector was found to be improved by irradiating the interface between the electrode and CdTe with a laser beam. The thermal stability of the electrode and CdTe indicates the formation of a p-n junction.

Topics

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