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Packing Conditions of Optical Separated CsI:Tl Scintillator by Silicon Collimator

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We have been developing a scintillator type X-ray imaging detector. The spatial resolution of this type detector is lower than that of direct conversion type detectors. This is because X-ray scintillation light spreads in the scintillator. To settle this issue, we proposed optical separations of scintillator by a silicon collimator, which is a silicon substrate processed into grid structure by the semiconductor micro processing technology. The silicon collimator which is filled with scintillators works as an X-ray imaging detector by joining with a photodiode array. In this study, melted Cesium Iodide doped with Thallium (CsI:Tl) was poured into the silicon collimator, and recrystallized. After that, Packing conditions of CsI:Tl in the silicon collimator were observed by Scanning Electron Microscope (SEM) and Computed Tomography (CT). These results suggested that holes on the silicon collimator was closely packed with CsI:Tl. An image of recrystallized CsI:Tl under X-ray irradiation was acquired. From this image we confirmed that CsI:Tl which was recrystallized in the silicon collimator emitted visible light by X-ray excitation. The pixel separation effects of the silicon collimator for light spreading was also confirmed. Moreover, a relative standard deviation of pixel value of the fabricated sample was lower than that of a sample made by the vacuum evaporation method in the previous study. This result indicated that uniformity of luminescence was improved.