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The CdTe detector module and its imaging performance

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In recent years investigations into the application of semiconductor detector technology in gamma cameras have become active world-wide. The reason for this burst of activity is the expectation that the semiconductor-based gamma camera would outperform the conventional Anger-type gamma camera with a large scintillator and photomultipliers. Nevertheless, to date, it cannot be said that this expectation has been met. ***Methods:*** While most of the studies have used CZT (Cadmium Zinc Telluride) as the semiconductor material, we designed and fabricated an experimental detector module of CdTe (Cadmium Telluride). The module consists of 512 elements and its pixel pitch is 1.6 mm. We have evaluated its energy resolution, planar image performance, single photon emission computed tomography (SPECT) image performance and time resolution for coincidence detection. ***Results:*** The average energy resolution was 5.5% FWHM at 140 keV. The intrinsic spatial resolution was 1.6 mm. The quality of the phantom images, both planar and SPECT, was visually superior to that of the Anger-type gamma camera. The quantitative assessment of SPECT images showed accuracy far better than that of the Anger-type camera. The coincidence time resolution was 8.6 ns. All measurements were done at room temperature, and the polarization effect that had been the biggest concern for CdTe was not significant. ***Conclusion:*** The results indicated that the semiconductor-based gamma camera is superior in performance to the Anger-type and has the possibility of being used as a positron emission computed tomography (PET) scanner.

Key words: semiconductor, detector, single photon emission computed tomography, energy resolution, cadmium telluride