Reference based Simulation Study of Detector Comparison for BNCT-SPECT Imaging

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To investigate the optimal detector material for prompt gamma imaging during boron neutron capture therapy, in this study, we evaluated the characteristic regarding radiation reaction of available detector materials using a Monte Carlo simulation. Sixteen detector materials used for radiation detection were investigated to assess their advantages and drawbacks. The estimations used previous experimental data to build the simulation codes. The energy resolution and detection efficiency of each material was investigated, and prompt gamma images during BNCT simulation were acquired using only the detectors that showed good performance in our preliminary data. From the simulation, we could evaluate the majority of detector materials in BNCT and also could acquire a prompt gamma image using the six high ranked-detector materials and lutetium yttrium oxyorthosilicate. We provide a strategy to select an optimal detector material for the prompt gamma imaging during BNCT with three conclusions.

Keywords: Boron neutron capture therapy (BNCT), Prompt gamma, Detector materials, Monte Carlo simulation.