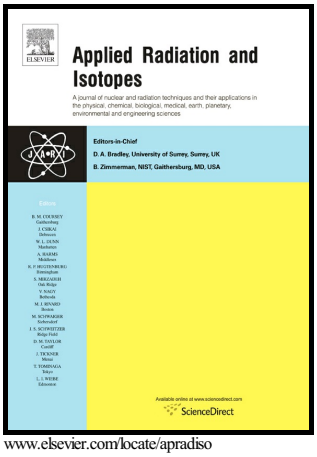

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Investigation of the neutron spectrum measurement method for dose evaluation in boron neutron capture therapy

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Abstract

In boron neutron capture therapy, it is important to evaluate the dose administered to a patient's body outside the tumour area. The exposure dose is evaluated by calculation; however, the calculated value must be validated using a measured value. The dose evaluations based on the measured neutron spectrum are investigated. Multi-foil activation, combined with a $LiCaAlF_6$ scintillation detector and an imaging plate, is proposed as a measurement method. The proposed method can measure the neutron spectrum at various points quickly.

Keywords

Boron neutron capture therapy, Multi-foil activation method, $LiCaAlF_6$ scintillation detector Imaging plate, Neutron spectrometry

1. Introduction

Boron neutron capture therapy (BNCT), a type of radiation therapy, can attack tumour cells selectively via reactions between the injected ^{10}B and the radiated neutrons (Locher, 1936). The therapeutic effect is obtained through the $^{10}B(n, \alpha)^{7}Li^{*}$ reaction and the deposition of a lethal radiation dose by the alpha particle. Initially, a nuclear reactor was adopted as the neutron source in BNCT. However, it is difficult to operate a nuclear reactor in a hospital. Therefore, a neutron source based on an accelerator technique has been suggested, which mainly generates epi-thermal neutrons (0.5 eV- 10 keV). Recently, accelerator-based neutron sources for BNCT have been developed and implemented worldwide instead of reactor-based neutron sources (Tanaka et al., 2009; Kumada et al., 2014; Halfon et al, 2015; Smick et al., 2016).