

Title

Preliminary study for dosimetry of boron neutron capture therapy with polymer gel

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Purpose:

Boron Neutron Capture Therapy (BNCT) is a treatment that injects boron into cancer, irradiates neutrons and kills only cancer cells, and neutron dose evaluation is a very important issue. The objective of this study is to produce polymer gels by mixing various materials to evaluate patient dose and incident neutron dose in BNCT, and to evaluate its properties for neutron dose evaluation.

Materials and Methods:

This study used MC-50 cyclotron installed in our institution to evaluate neutron dose. The MC-50 cyclotron uses protons as a source, can irradiate the neutron with a beryllium target from proton, and accelerate up to 50 MeV. Polymer gels were prepared by mixing HPLC, Gelatin, Methacrylic acid (MAA), Hydroquinone (HQ) and Tetrakis hydrozomethyl phosphonium chloride (THPC). Li₂SO₄, LiCl, and LIF were added to confirm neutron interaction. In addition, in order to confirm only the interaction with the neutrons, a polymer gel containing no neutron reaction material was prepared. The neutron doses were evaluated using a total of four polymer gels. In order to evaluate neutron doses separately by measuring the effects of neutrons and gamma rays separately, the gamma doses were evaluated using standard gamma rays (60-Co).

Results:

The properties of the polymer gel showed linearity as the neutron doses were increased to 5, 10, 15 Gy. In addition, as a result of repeated experiments using the same sample, the neutron dose was reproducible within 5%.

Conclusions:

The polymer gel developed in this study is expected to be used for various neutron experiments. In the future, various polymer gels will be used to investigate properties according to neutron dose rate and energy to study the polymer gel component ratio suitable for BNCT.

Keywords:

BNCT, neutron dosimetry, Polymer gel, MC-50 cyclotron

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