dosimetry

Development of a liquid Fricke dosimeter for boron neutron capture therapy

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Along with neutron sources and boron delivery agents, dosimetric control is necessary in BNCT. Currently, there are no clinically applicable dosimetry methods that would take into account all doses in BNCT: boron dose (dose from the α-particle and ^{7}Li nucleus), nitrogen dose (from thermal neutrons captured by nitrogen), hydrogen dose (arising from the reaction of ^{1}H absorption of a thermal neutron), background gamma dose (accompanying the neutron flux) and dose from fast neutrons (dose contributions of epithermal and fast neutrons from elastic scattering, mainly due to interaction with hydrogen atoms) [1]. Such dosimetry methods as activation foils, prompt gamma spectroscopy, water phantom and calculations on the NMC-based software package [2] are used on VITA setup for the treatment of domestic animals with spontaneous tumors.

It is proposed to use a chemical dosimeter, namely a ferrosulfate system or a Fricke dosimeter, to measure the total dose. When such a dosimeter is irradiated, Fe^{2+} is converted into Fe^{3+}. By measuring the concentration of Fe^{3+}, the dose can be determined.

The aim of the work is to develop a ferrosulfate dosimetry system for BNCT.

As a result, a method for chemically measuring the dose for BNCT was proposed, "conventional" and "neutron-sensitive" dosimeters with a complexing agent were developed, these dosimeters were calibrated in the range from 0 to 8 Gy, and a test irradiation was performed on the VITA neutron source, samples were analyzed on a spectrophotometer and spectra were obtained for further determination of the dose associated with neutrons. As an intermediate result, the total equivalent dose was calculated, which was 35 Gy.

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References:

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