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Estimation of Radioactivity Depth Distribution of Concrete in a BNCT Facility/BNCT 施設におけるコンクリートの放射化の深さ分布の推定

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In Boron Neutron Capture Therapy (BNCT) facilities, concrete of the treatment room is activated by neutrons and dose rate in the treatment room is still high after the end of neutron irradiation. The concrete wall surrounding the room is thick enough to reduce dose rate outside the room to a safety level. The concrete in certain area of the wall is highly radioactive. Estimating the amount of radioactivity depending on the depth from the concrete surface will provide important information for evaluating the safety and economic efficiency of future building demolition. In this study, we estimated the depth distribution of the amount of activation in concrete due to neutrons in a BNCT treatment room, the nuclides that contribute to the dose rate after the end of neutron irradiation, and the dose rate in the treatment room by the Monte Carlo radiation transport code PHITS. The wall behind the water phantom, which simulates a patient, is made of ordinary concrete and boron-containing concrete. The calculation results showed that the amount of concrete activation decreased for the boron-containing concrete, and that the depth up to about 50 cm from the surface made a large contribution to the dose rate in the treatment room.

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