LXXII International conference "Nucleus-2022: Fundamental problems and applications"

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Type: Oral talk (15 min + 5 min questions)

Photonuclear method of 161Tb production

Friday, 15 July 2022 15:00 (20 minutes)

 ^{161}Tb is a medical isotope that is considered in therapy as an alternative to the widely used ^{177}Lu . Currently, the main way of production of this radionuclide is the reactor method based on the neutron capture reaction followed by β -decay: $^{160}\text{Gd}(n,\gamma)^{161}\text{Gd} \rightarrow ^{161}\text{Tb}$. However, in this case it is necessary to use expensive enriched targets. This disadvantage is the reason why the development of alternative methods for production of the radioisotope ^{161}Tb is an important issue.

Theoretical analysis of the possibility of producing the radioisotope ¹⁶¹Tb by the photonuclear method was performed. Using cross sections calculated on the basis of a combined model of photonuclear reactions, the yields and activities of reactions ¹⁶²Dy(γ ,p) and ¹⁶³Dy(γ ,pn) on electron beam at energies up to 70 MeV were estimated. The side reaction activities of ¹⁶¹Dy(γ ,p), ¹⁶²Dy(γ ,pn), ¹⁶³Dy(γ ,p2n) and ¹⁶³Dy(γ ,p) were also analyzed. The optimal conditions for the production of ¹⁶¹Tb were chosen on the assumption that the activity of the main reaction should be more than 1MBq, and the activity of the side reactions should be 4 orders of magnitude less than it. The obtained results indicate the possibility of using the monoisotopes ¹⁶²Dy and ¹⁶³Dy at energies of 19-21 MeV and 25-27 MeV, respectively, to produce ¹⁶¹Tb radionuclide.

The speaker is a student or young scientist

Yes

Section

1. Nuclear technology and methods in medicine, radioecology

Primary authors: FURSOVA, Nadezhda (Faculty of Physics, Lomonosov Moscow State University, Russia); ALIEV, Ramiz (Faculty of Chemistry, Lomonosov Moscow State University, Russia. National Research Center "Kurchatov Institute", Moscow, Russia); BELYSHEV, Sergey (Faculty of Physics, Lomonosov Moscow State University, Russia. Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Russia.); KUZNETSOV, Alexander (Faculty of Physics, Lomonosov Moscow State University, Russia. Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Russia.); KHANKIN, Vadim (Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Russia)

Presenter: FURSOVA, Nadezhda (Faculty of Physics, Lomonosov Moscow State University, Russia)

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