Production cross sections of dysprosium radioisotopes in deuteron-induced reactions on natural terbium up to 24 MeV

*Ichinkhorloo Dagvadorj[1], Masayuki Aikawa[1,2], Tsoodol Zolbadral[2],
Yukiko Komori[3] and Hiromitsu Haba[3]
[1]Faculty of Science, Hokkaido University, Sapporo 060-0810, Japan
[2]Graduate School of Biomedical Science and Engineering, Hokkaido University, Sapporo 060-8638, Japan
[3]Nishina Center for Accelerator-Based Science, RIKEN, Wako 351-0198, Japan

Activation cross sections of deuteron-induced reactions on natural terbium up to 24 MeV were measured. In this paper, the production cross sections of ^{157,159}Dy were determined and compared with the experimental data studied earlier and the TENDL-2017 data.

Keywords: Dysprosium radioisotopes, Deuteron irradiation, Terbium target, Excitation function, Cross section

1. Introduction

The radioisotopes ^{157}Dy ($T_{1/2}$ = 8.14 h) and ^{159}Dy ($T_{1/2}$ = 144.4 d) can be used in the nuclear medicine [1,2]. The production of the dysprosium radionuclides is worthy to study. They can be produced by charged-particle-induced reactions on the mono isotopic element ^{159}Tb. We focused on deuteron-induced reactions on ^{159}Tb.

2. Experimental

In this experiment, a 24-MeV deuteron beam accelerated at the RIKEN AVF cyclotron was used. The stacked foil technique, the activation method and the high resolution γ-ray spectrometry were used to determine activation cross sections of the ^{159}Tb(d,x)^{157,159}Dy reactions.

3. Result

Production cross sections of ^{159}Dy were determined as shown in Fig. 1 in comparison with the experimental data published earlier [3,4] and the TENDL-2017 data [5]. Our experimental data have a peak at around 14 MeV, which are the same as other experimental data while the amplitudes are largely different. The TENDL-2017 data slightly deviate from ours.

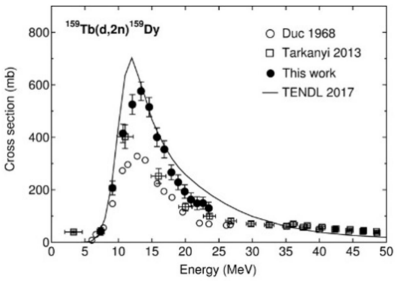

Fig. 1. Excitation function of the ^{159}Tb(d,2n)^{159}Dy reaction

4. Conclusion

We performed an experiment to obtain cross sections of the ^{159}Tb(d,x)^{157,159}Dy reactions, which can contribute to find the best route to produce the medical radioisotopes. The cross sections could be determined and found to be different from the previous experimental data.

References

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