A SYSTEMATIC STUDY OF EXCITATION FUNCTIONS IN ALPHA PARTICLE INDUCED REACTIONS AT MODERATE EXCITATIONS: A COMPARATIVE STUDY OF PRE-EQUILIBRIUM EMISSION MODEL CODES

Avinash Agarwal[1], Manoj Kumar Sharma[2], I. A. Rizvi[3], and A. K. Chaubey[4]
[1]Department of Physics, Bareilly College, M.J.P. R. University, Bareilly, India;[2]Department of Physics, Shri Varshney College, Aligarh, India; [3]Department of Physics, AMU, Aligarh, India; [4]Department of Physics, Addis Ababa University, Addis Ababa, Ethiopia
E-mail: avibcb@gmail.com

Excitation functions (EFs) of alpha induced reactions in the intermediate energy region are of increasing importance for a wide variety of applications e.g., medical radioisotope production, radiation and shielding effects in space and technology development of an accelerator driven system for transmutation of nuclear waste or for energy production [1,2]. In addition to above mentioned facts the information on the excitation function of residual nuclei is also important for verification of different nuclear models used to explain the reaction mechanism, optimize the production yield, and estimation of the impurities of radioisotopes simultaneously produced. In the frame of a systematic study of excitation functions for production of medically relevant radioisotopes by charged particle induced reactions on rare earths, the ^{165}Ho(α,2n)^{167}Tm reaction and the ^{165}Ho(α,n)^{168}Tm, ^{165}Ho(α,3n)^{166}Tm, ^{165}Ho(α,4n)^{165}Tm side reactions were measured up to 40 MeV employing well established stacked foil activation technique followed by offline HPGe gamma-ray spectroscopy. The measured results were compared to the earlier measurements available in literature. The analysis of measured excitation functions has also been performed using Monte Carlo nuclear reaction simulation code COMPLET [3], ALICE-91 [4], and Talys1.9 [5]. The prime interest of the present work is to perform a quantitative comparison of earlier reported experimental data with those obtained with theoretical model codes, to study the quality/predictability of the model codes and they fit the excitation functions of the experimental values more specially for the medically relevant radioisotope ^{165}Tm.

1. A. Aydin, B. Şarer, and E. Tel, Applied Radiation and Isotopes 65, 365 (2007).
2. F. Kilinc, N. Karpuz, and B. Cetin, Acta Physica Polonica A 130, 318 (2016).
3. J. Ernst, *Proc. 8th Int. Conf. on Nuclear Reaction Mechanisms* ed. E. Gadioli, Varenna, Italy, p.292(1997).
4. M. Blann and H. K. Vonach, Phys. Rev. C **28**, 1475 (1983)., M. Blann, LLNL Report No. UCID 19614, (1982).
5. A.J. Koning, D. Rochman, J. Sublet, N. Dzysiuk, M. Fleming and S. van der Marck, "TENDL: Complete Nuclear Data Library for Innovative Nuclear Science and Technology", Nuclear Data Sheets 155 (2019)