Charged particle induced reaction cross Sections on p-isotopes of erbium for the astrophysical γ-process

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The γ-process, i.e., a sequence of photodisintegration reactions, (γ,n), (γ,p), and (γ,α) on heavy nuclei at temperatures of 2-3×10^9 K is the favored mechanism responsible for the production of p-nuclei with masses larger than 100. Most of the involved reaction rates are experimentally unknown and typically calculated with the statistical Hauser-Feshbach (HF) model. Although the γ-process has been mostly successful in explaining the production of a large range of p-nuclei, two mass regions remain problematic, A<124 and 150≤A≤165, where a number of p-nuclei are under-produced. Whether the origin of the problem arises from deficiencies in the astrophysical models or the statistical model and nuclear input parameters has not as yet been clearly identified.

In order to test the reliability of the HF calculations and to provide a systematic understanding of the γ-process at energies of astrophysical interest, charged particle induced reaction cross sections of erbium isotopes with A=162 and 164, which are p-nuclei, have been measured using FN Tandem Accelerator at the University of Notre Dame. The reaction yields have been determined by the observed activity of produced radioactive isotopes, which was detected off-line by a HPGe detector. The obtained cross sections and astrophysical *S* factors are presented and compared with calculations from two statistical model codes: NON-SMOKER and TALYS.