VARIATION IN THE ^{64}Ge$(p,\gamma)^{65}$As REACTION RATES

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We report on the variation in the ^{64}Ge$(p,\gamma)^{65}$As reaction rates due to uncertainties of either nuclear mass and level structure of the ^{65}As isotope or non-resonant reaction rates. The change in the reaction rates is from a few factors to one order of magnitude due to the uncertainty of the non-resonant rates, which were calculated using the astrophysical S-factor and the statistical Hauser–Feshbach model. The mass uncertainty of the ^{65}As nucleus ($\Delta m = 85$ keV) results in a variation of a few factors in the reaction rates at $T_9 = 1$. At present, the estimated effective lifetimes of ^{64}Ge in the rp-process are ranging from 0.5 to 162 ms. The results indicate that the resonance at $E_x = 1.155$ MeV and the Q-value of the reaction must be precisely determined to improve the accuracy of rp-process simulations.

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1. Introduction

The thermonuclear explosion in X-ray bursts (XRBs) [1–4] is triggered by the hot hydrogen burning in which the seed nuclei rapidly capture protons to synthesize heavier isotopes, namely the rp-process [4]. This process is

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