

Data analysis of the $^{26}\text{Si}(\alpha, p)^{29}\text{P}$ reaction for the nucleosynthesis in the X-ray bursts

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The αp -process, consisting of a series of (α, p) and (p, γ) reactions, plays an important role in nucleosynthesis during X-ray bursts. Among these reactions, the $^{26}\text{Si}(\alpha, p)^{29}\text{P}$ reaction is particularly significant due to its substantial impact on the light curve of X-ray bursts. Despite its importance, experimental data for this reaction remain insufficient due to technical reasons.

In this study, we performed a direct measurement of the $^{26}\text{Si}(\alpha, p)^{29}\text{P}$ reaction at the CNS RI beam separator (CRIB). We measured the reaction at energies corresponding to the high-temperature environment around $T = 3$ GK using the ^4He thick gas target method.

Despite numerous background events, we determined the reaction cross section, which was approximately an order of magnitude lower than the value of the NON-SMOKER statistical model.

This research represents the first experimental determination of this reaction cross section through direct measurement. Consequently, our results will provide valuable insights for estimating the reaction rate in the high-energy region and for refining the X-ray burst light curve model.

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