

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

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In the X-ray bursts, the αp -process, that consists of alternating (α, p) and (p, γ) reactions, is considered to have a great impact on the light curve. However, most of the important reactions have not been understood experimentally because of technical difficulties. The $^{26}\text{Si}(\alpha, p)^{29}\text{P}$ reaction rate is one of the αp -process reactions and it is considered that the reaction rate has high sensitivity to the X-ray burst light curve. Therefore, a direct measurement of the reaction was performed at the CNS RI beam separator (CRIB). CRIB produced a ^{26}Si beam with a typical intensity of 3.2×10^4 pps and a purity of 29%, which bombarded the ^4He gas target. We measured the reaction particles using five telescopes consisting of three and four silicon detectors. The $^{26}\text{Si}(\alpha, p)^{29}\text{P}$ reaction was measured up to the center-of-mass energy of about 7.5 MeV, corresponding to about 3 GK of Gamow energy, using the thick gas target method. Because of insufficient statistics, the statistical error became large but an upper limit on the cross section was obtained, which was 0.134 times that of the NON-SMOKER statistical model. The results are useful for comparing experimental and theoretical values at higher temperatures and for constraining the $^{26}\text{Si}(\alpha, p)^{29}\text{P}$ reaction rate. The analysis method and the results will be discussed.

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