Investigation of the $^{30}\text{S}(p, \gamma)^{31}\text{Cl}$ reaction via Coulomb dissociation

YASUHIRO TOGANO, RIKEN Nishina Center, RNC R403N COLLABORATION — The Stellar reaction $^{30}\text{S}(p, \gamma)^{31}\text{Cl}$ was studied via Coulomb dissociation. The nucleus $^{30}\text{S}$ is a candidate for the waiting point, which the reaction flow temporarily stops at this nuclei, in the rapid proton capture ($rp$) process. The $^{30}\text{S}(p, \gamma)^{31}\text{Cl}$ reaction decreases the amount of $^{30}\text{S}$, and thus speeds the reaction flow of the $rp$ process up. Therefore the strength of this reaction affects the resultant abundance and energy production in the $rp$ process. No direct measurement of the $^{30}\text{S}(p, \gamma)^{31}\text{Cl}$ reaction has been made so far. The aim of the present work is to determine the resonant capture reaction rate of $^{30}\text{S}(p, \gamma)^{31}\text{Cl}$ from the result of Coulomb dissociation of $^{31}\text{Cl}$. The experiment was performed at the RIKEN Nishina Center. The secondary beam of $^{31}\text{Cl}$ at 58 MeV/nucleon was produced and separated using the RIKEN Projectile Fragment Separator (RIPS). The beam of $^{31}\text{Cl}$ bombarded a $^{208}\text{Pb}$ target. The momentum vectors of the breakup products, the isotopes $^{30}\text{S}$ and protons, were determined using the detectors located at downstream of the target. The relative energy spectrum of $^{30}\text{S} + p$ system was extracted using invariant-mass method. In this presentation, we discuss the unbound state of $^{31}\text{Cl}$ which is relevant to the resonant capture in the $^{30}\text{S}(p, \gamma)^{31}\text{Cl}$ reaction.

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