The Cosmological Lithium Problem (CLP) is a well-known issue in astrophysics, which is an overestimation of the primordial ^{7}Li abundance in the standard Big Bang nucleosynthesis (BBN) model compared to astrophysical observations. Our research aims to resolve the CLP by measuring the cross section of the $^7\mathrm{Be}(d,p)^8\mathrm{Be}$ reaction. The majority of ^{7}Li nuclei were produced by the electron capture decay ($T_{1/2} = 53.22$ days $= 4.6 \times 10^6$ seconds) of ^{7}Be. ^{7}Be nuclei were produced in several hundred seconds during the BBN, leading to a timescale difference of over 10^4 between the production of ^{7}Li and ^{7}Be. This large timescale difference suggests that if more ^{7}Be nuclei were destroyed during the BBN, it could result in a lower abundance of ^{7}Li, potentially resolving the discrepancy.

Our study focuses on the $^7\mathrm{Be}(d,p)^8\mathrm{Be}$ reaction based on a theoretical suggestion that this reaction played a significant role in the destruction of ^{7}Be nuclei during the BBN [1]. The measurement of the absolute cross section in the Big Bang energy region ($E_{\mathrm{c.m.}} = 0.1 - 0.4$ MeV) was crucial for understanding the nuclear reactions in the primordial universe.

We produced a radioactive ^{7}Be target and measured the $^7\mathrm{Be}(d,p)^8\mathrm{Be}$ reaction cross section at the tandem facility of Kobe University in Japan. A particular feature of this experiment was the production of the unstable nucleus ^{7}Be as a target. The thick target analysis method was applied to determine the cross sections. The cross section at the lowest energy of $E_{\mathrm{c.m.}} = 0.12$ MeV was obtained with the highest sensitivity compared to the available data [2, 3, 4]. We confirmed that the measured $^7\mathrm{Be}(d,p)^8\mathrm{Be}$ cross sections have a limiting impact on resolving the CLP.

This talk will outline the key details and discuss future perspectives.

Reference

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