Contribution ID: **125** Type: **Poster**

Development of enriched ^{12}C CVD diamond targets for astrophysical $^{12}C(\alpha, \gamma)^{16}O$ reaction measurements

Monday, 9 September 2024 16:48 (1 minute)

The $^{12}C(\alpha, \gamma)^{16}O$ reaction is a pivotal process in nuclear astrophysics. Due to its extremely low cross section (~10^{-17} barn) within the Gamow window, directly measuring this reaction is highly challenging. An irradiation-resistant ^{12}C-enriched target is a key technique for the direct measurement of the $^{12}C(\alpha, \gamma)^{16}O$ reaction. In this work, we developed a ^{12}C-enriched diamond target on Mo substrates using the chemical vapor deposition (CVD) method. The target demonstrates excellent stability under bombardment with a high-intensity proton beam. A 1.5% deterioration in ^{12}C thickness was observed after bombardment by a 270 keV, 2 mA proton beam with a charge of 125 C, indicating a significant improvement over typical carbon targets. The $^{13}C/^{12}C$ ratio in the target was determined to be $(1.1 \pm 0.3) \times 10^{-4}$, indicating no contamination was introduced during the CVD process. A method for determining the hydrogen content in coatings based on nuclear reactions is presented. The upper limit of the hydrogen content in the diamond 12C-enriched target was found to be 0.075%. The irradiation-resistance capacity and isotopic purity of the target meet the requirement for direct measurement.

Primary author: DONG, Jingyu (CIAE)

Presenter: DONG, Jingyu (CIAE)

Session Classification: Poster presentation