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The ^{16}O(p,α)^{13}N reaction in type 1a supernovae

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The ^{16}O(p,α)^{13}N reaction plays a key role in controlling the Ca/Si and Ca/S ratios synthesized during α-rich oxygen burning in Type Ia supernovae (SNIa). This reaction feeds the α-rich burning branch by converting ^{16}O into ^{12}C via the chain of ^{16}O(p,α)^{13}N(γ,p)^{12}C. Moreover, the ^{16}O(p,α)^{13}N rate is highly sensitive to the progenitor white dwarf metallicity. However, current models cannot reproduce all observations using standard reaction rate libraries. Moreover, substantial uncertainties (factors > 2) exist in available ^{16}O(p,α)^{13}N rates, presenting challenges for reliably modelling Type Ia supernova nucleosynthesis.

Therefore, a new direct experimental measurements of the ^{16}O(p,α)^{13}N reaction cross section, at center-of-mass energies $E_{\rm cm} = 6.9-5.6\,{\rm MeV}$, using the MUSIC active-target detector at the ATLAS facility at Argonne National Laboratory was performed. The measured cross sections are used to compute the ^{16}O(p,α)^{13}N reaction rate at the relevant temperatures for SNIa models. The results from this work will be presented and the implications for SN1a nucleosynthesis discussed.

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