

Ab initio calculation of the ${}^3\text{He}(\alpha, \gamma){}^7\text{Be}$ astrophysical S factor

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1 Abstract

The ${}^3\text{He}(\alpha, \gamma){}^7\text{Be}$ radiative-capture reaction rates between 20 and 500 keV are essential in understanding the primordial ${}^7\text{Li}$ abundance in the universe. The Coulomb repulsion between the fusing nuclei suppresses the capture cross section at these low energies, making it difficult to measure directly. Theoretical calculations are needed to guide the extrapolation to the solar energies of interest. To this end, I will present NCSMC calculations of the ${}^3\text{He}(\alpha, \gamma){}^7\text{Be}$ reaction within the no-core shell model with continuum starting from two- and three-nucleon chiral interactions. To demonstrate that the NCSMC provides an accurate S factor, I will also compare NCSMC ${}^3\text{He} + {}^4\text{He}$ elastic-scattering cross sections with those recently measured by the SONIK collaboration.

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