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Ab initio prediction of $\alpha(d,\gamma)^6$Li and impact of the ^{6}Li properties onto alpha-induced reactions of astrophysical interest.

The radiative capture $\alpha(d,\gamma)^6$Li is the dominant process in the Big Bang Nucleosynthesis (BBN) of ^{6}Li. It therefore strongly influences the abundance ratio of ^{6}Li/^{7}Li, for which observational data are three orders of magnitude higher than BBN predictions. Because of the low cross section and the large experimental uncertainties, it is crucial to have accurate predictions. In this talk, I will present an ab initio calculation of $\alpha(d,\gamma)^6$Li, where all nucleons are active and interacting through chiral-EFT nucleon- and three-nucleon forces. After reviewing the ab initio no-core shell model with continuum method, I will show our results [1] which are in excellent agreement with the recent LUNA data [2] and analyze the importance of each electromagnetic transitions on $\alpha(d,\gamma)^6$Li at BBN energies. In the last part of the talk, I will discuss how this ab initio prediction of ^{6}Li impact the properties extracted from $(^6\text{Li},d)$ transfer data, and the repercussions on the evaluation of the $^{13}\text{C}(\alpha,n)^{16}\text{O}$ and $^{12}\text{C}(\alpha,\gamma)^{16}\text{O}$ reaction rates, which are relevant for the astrophysical s-process nucleosynthesis and helium burning reactions.

[1] C. Hebborn, G. Hupin, K. Kravvaris, S. Quaglioni, P. Navrátil and P. Gysbers, Phys. Rev. Lett. 129, 042503 (2022).

Anders et al. Phys. Rev. Lett. 113, 042501 (2014).

Thursday 6 July 2023, 14h00
IJCLab, Bât. 100, room A018