Progress on Light-Ion Fusion Reactions with Three-Nucleon Forces

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The description of structure and dynamical properties of nuclei starting from the fundamental interaction between nucleons has been a long-standing goal in nuclear physics. The *ab initio* no-core shell model combined with the resonating-group method (NCSM/RGM) [1,2] is capable of addressing both structural and reaction properties of light-nuclei but is not completely efficient in grasping the short range correlations in the wave function. To overcome this, the NCSM/RGM binary cluster basis has recently been coupled to square-integrable NCSM eigenstates in the no-core shell model with continuum (NCSMC) [3] approach. While promising results have already been achieved starting from a two-body Hamiltonian, a truly realistic prediction of nuclear observables requires the treatment the three-nucleon interactions. Using similarity-renormalization-group evolved two- and three-nucleon interactions [4,5], we will present N-^{4}He and d-^{4}He scattering processes when accounting for the chiral two- plus three-nucleon interaction versus the chiral two-nucleon interaction. This work paves the way to modeling of light-ion fusion reactions with realistic nuclear forces, that are important for understanding nuclear astrophysics processes.[1]

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