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The role of deformation in the 17C structure and its influence in transfer and breakup reactions

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Light exotic nuclei are so close to neutron or proton driplines that they are usually described within two- or three-body models made of an inert spherical core and one or two nucleons barely bound. However, deformation plays a key role in certain areas of the Segrè Chart, thus the need of going beyond a spherical picture for certain nuclei. This is the case of ^{17}C.

Deformed two-body models are used to describe the structure of ^{17}C. They consist of a neutron moving under the action of a deformed potential generated by the core. On the one hand, we have considered the semi-microscopic particle-plus-AMD (PAMD) model from [Phys. Rev. C 89 (2014) 014333], assuming weak-coupling between the fragments. On the other hand, we consider a model based on Nilsson assuming strong-coupling.

Energies and associated wave functions are obtained by diagonalizing the Hamiltonian in a transformed Harmonic Oscillator basis (THO). This basis has been successfully applied to the discretization of the continuum of two-body and three-body weakly bound nuclei for the analysis of break up and transfer reactions [Phys. Rev. Lett. 109 (2012) 232502, Phys. Rev. C 94 (2016) 054622].

The aforementioned structure models for ^{17}C are tested by studying the transfer reaction ^{16}C(d,p)^{17}C. Good agreement is found for the transfer to bound states by comparing with the experimental data from [Phys. Lett. B 811 (2020) 135939]. Preliminary results for the transfer to the unbound states of 17C have also been obtained. In addition, the continuum is studied performing a break up reaction, comparing with the experimental data from [Phys. Lett. B 660 (2008) 320].

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