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Application of the Nilsson Model to the structure and reactions of exotic weakly bound nuclei

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The structure of the deformed weakly-bound nuclei ^{17}C, ^{19}C and ^{11}Be has been studied within the strong-coupling limit, using the Nilsson model. A novel approach is used to obtain the energies and associated wave functions for bound states and some low-lying resonances of the system, consisting in diagonalizing the Nilsson Hamiltonian in a basis of transformed harmonic oscillator (THO) functions. This basis has been successfully applied to the discretization of the continuum of weakly bound nuclei applied to break up and transfer direct reactions both for two-body and three-body systems [Phys. Rev. Lett. 109 (2012) 232502, Phys. Revi. C 94 (2016) 054622].

To assess the quality and accuracy of the calculated wavefunctions, the latter have been used as ingredients to calculate differential cross sections of neutron transfer reactions in which one of these nuclei is involved. Considering the Adiabatic Distorted Wave Approximation(ADWA),the calculations are made for the reactions ^{11}Be(p,d)^{10}Be and ^{16}C(d,p)^{17}C, being compared respectively with the experimental data from [Chin. Phys. Lett. 35 (2018) 082501] and [Phys. Lett. B 811 (2020) 135939].

Topic

Theory

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