MEAN FIELD DERSCRIPTION OF OPEN SHELL NUCLEI USING A REGULARIZED PSEUDOPOTENTIAL

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A regularized pseudopotential was recently proposed for the mean-field description of infinite nuclear matter and doubly magic nuclei [1-3]. This pseudopotential, which takes the form of a two-body interaction with a gaussian form factor and contains derivative terms, was shown to lead to reasonable results for the canonical values of nuclear matter properties but the isoscalar effective mass which was too small.

Here we discuss how the use of a zero-range three-body interaction can remedy this latter problem. We adjusted parameters of the new pseudopotential so as to reproduce infinite nuclear matter properties and magic and open shell spherical nuclei using a newly developed code, FINRES$_4$ [4]. This code can solve the Hartree-Fock-Bogolyubov equations on a space-coordinate mesh with a finite-range interaction, such as the pseudopotential that we consider here or a Gogny type interaction. The code allowed us to constrain the parameters of the pseudopotential both in the particle-hole and particle-particle channel. We also implemented the new pseudopotential in the deformed triaxial code HFODD [5,6].

Results for closed shell, open shell, and deformed nuclei will be presented along with a discussion on how the new pseudopotential can possibly be further improved by considering non-local 2-body terms or by introducing a finite-range 3-body term.

Work supported by the Academy of Finland and University of Jyväskylä within the FIDIPRO program.

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