FINITE SIZE EFFECTS IN THE STUDY OF EQUATION OF STATE FOR THE NUCLEI WITH SKYRME FORCE

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ABSTRACT

The equation of state for symmetric nuclear matter and finite nuclei has been investigated using self-consistent Hartree Fock approach. Several versions of Skyrme effective interaction and Hill-Wheeler formula are employed in the calculation. The finite size effect parameter a_F, which is introduced into the Hill-Wheeler formula, is determined by comparing theoretical calculations and experimental results for the zero temperature properties. The dependence of a_F on the effective interaction employed has been studied. It was found that different versions of Skyrme force lead to different values for a_F apart from SKI and SKIII which gave a similar value. Also, the a_F values obtained with Skyrme interaction were different from what was obtained with Gogny force with the exception of SKV interaction which gave a value of $a_F = 0.35$ identical to the value obtained with D1 Gogny interaction. The critical points of the first order phase transition for the nuclear matter and finite size nuclei calculated with the several versions of Skyrme force were different from each other. The largest value of critical temperature for nuclear matter is given by SKV force as $T_c = 39.45$ MeV, while SKIII interaction gives the smallest value as $T_c = 21.65$ MeV. Similarly, the largest value of the critical density is given by SKV interaction. The critical points depend on the number of nucleons in the system and T_c decreases as the number of nucleons in the system decreases.

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