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Large-scale calculation of nuclear ground-state properties

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Presently, the nuclear energy density functional theory is known as the most convenient and powerful theoretical tool for the calculation of the properties of nuclei throughout the nuclear chart. In this work, large-scale calculations are performed using the self-consistent Hartree-Fock-Bogoliubov method [1-2] for even-even nuclei between $8 \leq Z \leq 114$. The Skyrme-type functionals are used in the particle-hole channel of the calculations, and zero-range density-dependent pairing force of the surface, mixed, and volume type are employed in the particle-particle channel. Binding energies, two-particle separation energies, charge radii, deformation, and neutron skin thickness properties of nuclei are studied and compared with the available experimental data. The impact of the usage of the different types of pairing forces on the properties of nuclei and location of the particle drip lines are also studied.

1. M. Stoitsov et al., Comput. Phys. Commun. 184, 6 (2013).
2. R.N. Perez et al., Comput. Phys. Commun. 220 (2017).

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