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Covariant density functional theory for nuclear structure

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Covariant density functional theory with a minimal number of parameters allows a very successful description of nuclear structure properties range from ground state to excited state all over the nuclear chart. With pairing correlations and the continuum effect properly taken into account, the self-consistent microscopic descriptions and predictions of the neutron halo phenomena in both spherical and deformed nuclei become possible. Constrained and cranking calculations, CDFT in a static external field, are powerful tools to investigate the shape evolution, shape isomers, shape-coexistence, fission landscapes, and rotational spectra in both near spherical and deformed nuclei. RPA calculation based on CDFT provides a successful description of the mean energies of nuclear giant resonances. The restoration of symmetries and configuration mixing to take into account fluctuations around the mean-field equilibrium based on CDFT as well as its simplification, collective Hamiltonian, describe well the nuclear low-lying states and shape transitions well. Future perspective on CDFT application for nuclear astrophysics and its future development will be discussed.

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