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Recent Developments in Extended Density Functional Theories

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Last decade, the considerable progress of self-consistent nuclear structure theories based on the density functional concept has shown that they represent a successful strategy toward a universal and precise description of low-energy nuclear dynamics. Driven by fast progressing disciplines like astrophysics, exotic nuclear structure experimental studies and synthesis of superheavy elements, the nuclear density functional theories (DFT) have achieved a level of sophistication which permits description of a wide range of properties for arbitrarily heavy nuclei including those at neutron and proton drip lines. Extended DFT approaches include temporal and spatial non-localities into in-medium nucleonic interaction and, thus, allow for delicate interplay of various kinds of correlations which are responsible for binding of loosely-bound systems, for decay properties and for excitation spectra. Recent developments and perspectives of the extended DFT are discussed in light of their applications to research topics at radioactive beam facilities like NSCL/FRIB, GSI/FAIR, RIKEN/RIBF. Prospects of the extended DFT to provide a consistent input for astrophysical modelling, aiming to understand the elemental composition of the universe, are outlined.