The limits of existence of finite nuclei is one of interesting questions of modern low-energy nuclear physics. Very systematic and detailed investigation of superheavy nuclei has been performed in recent years within the covariant density functional theory (CDFT). Different features of superheavy nuclei such as the ground state properties and underlying shell structure [1,2], single-particle [3] and alpha decay [1] properties, fission barriers [4] etc have been studied in detail. Major results of these studies will be discussed. In addition, the assessment of systematic and statistical uncertainties for relevant physical observables has been performed for the first time. This knowledge allows to better evaluate the predictive power of the CDFT in extrapolating to superheavy nuclei and beyond. Based on that, we study hyperheavy nuclei with proton numbers \( Z > 126 \). Basically nothing is known about their potential existence and stability since almost all theoretical studies consider only spherical shapes. On the contrary, our study is performed in axially deformed relativistic Hartree-Bogoliubov theory and covers hyperheavy nuclei up to proton number 184. Most important features of such nuclei will be presented.


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