Superheavy nuclei - predictions on their structure & stability

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We intend to review the results on the structure and stability of superheavy nuclei obtained by using both micro-macro Woods-Saxon model and the self-consistent Skyrme-Ly6 Hartree-Fock-BCS approach. These will be ocasionally contrasted with other results. The first method is well tested and reasonably reproduces both first and second barriers in actinides and experimentally estimated barriers in superheavy nuclei. The results of the other one allow to appreciate differences and similarities between different models.

The points we investigate are:

- possible exotic nuclear shapes & their stability,
- properties of odd nuclei, including possible K-isomers,
- Q_α energies,
- fission barriers & life-times
- the limits of stability beyond $Z = 126$,

In all cases the primary interest is in fission barriers which determine in the gross part the stability against fission. The quasiclassical fission rates via minimal action with cranking mass parameters are obtained in selected cases.

The first point relates to oblate ground states and associated triaxial fission paths for Z$\geq$ 118. The results are obtained mostly within the micro-macro model.

The second point relates to the stability enhancement of odd-Z and odd-N systems which is studied mostly within the micro-macro approach.

The next two points relate to predictions within the Woods-Saxon model, also including odd and odd-odd nuclei.

The last point involves a far extrapolation of known models and is studied with both approaches. A dramatic influence of triaxial shapes on barriers in $Z > 126$ nuclei is found. The results suggest that stability limits cannot be too far from $Z = 126$, unless some exotic non-compact configurations exist.