Non-axial deformations of high multipolarities of heavy and superheavy nuclei

Leonid Shvedov
Sołtan Institute for Nuclear Studies, Hoża 69, PL-00-681 Warsaw, Poland

The assumption of reflection symmetry of a nucleus with respect to the three main planes of the intrinsic frame of reference of it is reasonable for heaviest nuclei. However, even for only quadrupole and hexadecapole deformations, this leads to 5 degrees of freedom. Addition of deformations of multipolarities 6 and 8, which are still important for these nuclei, increases the number of these degrees by 4 and 5, respectively. This makes the calculations of nuclear properties in such large deformation space impossible at the present time.

In the paper, there is discussed a way of reducing this space and it is tried to estimate the effect of this reduction on the potential energy of heavy and superheavy nuclei. The energy is calculated within a macroscopic-microscopic approach.

As an application of the analysis, the influence of the investigated deformations on the heights of the (static) fission barriers of heaviest nuclei is studied. The heights of the barriers are basic quantities for description and predictions of cross sections for the synthesis of superheavy nuclei. They are sensitive functions of the deformation space used for their calculation.