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Microscopic approach to the structure of superheavy nuclei

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A fully microscopic theoretical framework based on nuclear relativistic energy density functionals (REDFs) [1] is applied to studies of shape evolution, excitation spectra and decay properties of superheavy nuclei. On the self-consistent mean-field level the microscopic approach is used in the description of rapid shape transitions, from spherical to axial and triaxial, in alpha-decay chains of superheavy nuclei [2,3]. The occurrence of a deformed shell gap at neutron number N=162, and its role on the stability of nuclei in the region around Z=108 is investigated. Predictions for long-lived high-K isomeric states are compared with very recent data in the decay chain of ^{270}Ds [4].

An especially interesting feature in the region of heavy and superheavy elements is the possible occurrence of shape-phase transitions and critical-point phenomena. A collective Hamiltonian model [5], based on microscopic REDFs is employed in studies of shape coexistence phenomena, complex excitation patterns and electromagnetic transition rates associated in Hs isotopes with the evolution of shell structures. Microscopic signatures of ground-state shape phase transitions are analyzed [4] using excitation spectra and collective wave functions obtained by diagonalization of a quadrupole collective Hamiltonian, with parameters fully determined by microscopic self-consistent mean-field calculations for triaxial shapes.

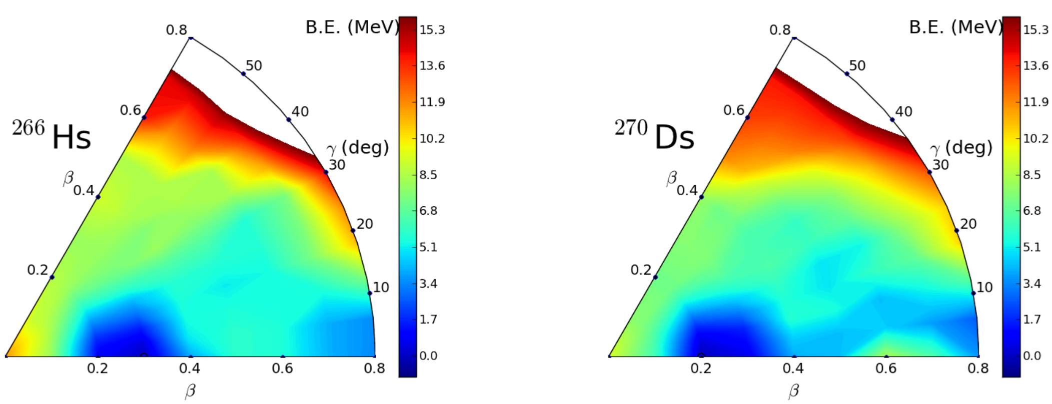

Figure 1: *Triaxial energy maps of ^{266}Hs and ^{270}Ds.*

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[4] V. Prassa, Bing-Nan Lu, T. Nikšić , and D. Vretenar (in preparation) .
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