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Study of the fission process in ^{263}Bh and ^{269}Bh on the path toward the Island of Stability

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The aim of this work is to investigate the fission process in the transitional region of the nuclear chart, with the goal of progressively approaching the predicted island of stability through both the systematic analysis of newly available experimental data and an improved theoretical description. Two Bohrium isotopes, ^{263}Bh and ^{269}Bh , located between the heavy actinides and the superheavy nuclei near the island of stability, have been studied through their most relevant observables: the mass and total kinetic energy distributions of the primary binary fragments, reconstructed from measured flight times and hitting position of fragment using a two-arm time-of-flight spectrometer TOSCA (ToF-2V method).

To interpret these data and to achieve a more comprehensive understanding of the fission process, the original Pashkevich routine implemented in the mymash code was extended to build a consistent theoretical framework suitable for describing the fission decay of superheavy compound nuclei formed in heavy-ion induced reactions, systems produced at moderate excitation energies and angular momenta. The resulting model, referred to as SAF (Stationary Approach to Fission), incorporates both the damping of shell effects with increasing excitation energy and the rotational contribution associated with angular momentum.

The analysis focuses on the evolution of fission modes in ^{263}Bh and ^{269}Bh , with the aim of determining whether the transition between elongated asymmetric and compact symmetric modes persists in these isotopes and whether it is consistent with the experimental observations. A major difficulty in this mass region arises from the overlap between fusion-fission and quasi-fission processes. One of the objectives of this work has been therefore perform the experimental campaign at different excitation energies to study the evolution of fission modes and exploit SAF calculations also to constrain the fusion-fission component in the experimental distributions, enabling a more reliable interpretation of the data.

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