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Study of high-energy fission and quasi-fission with inverse kinematics

Since its discovery, fission appeared as a complex process where different nuclear properties interplay shaping the characteristics of the emerging fission fragment distributions. In general, the influence of the shell effects is expected to decrease with increasing excitation energy of the fissioning nucleus, making the process driven by almost pure liquid-drop properties. Recently, some features in the total kinetics energy and in the N/Z distributions of the fragments, commonly associated with shell effects, came out in a series of experiments with high excitation energy fusion-fission reactions in inverse kinematics. Indeed, fusion-induced fission in inverse kinematics has proved to be a powerful tool to investigate nuclear fission, giving access to other observables with respect to a direct kinematics approach and thereby adding new information on the fission fragments.
The use of inverse kinematics with the VAMOS magnetic spectrometer at GANIL (France) coupled with the SPIDER telescope allows the identification of the fissioning system and permits to extract properties such as the total kinetics energy, and the mass and atomic number distributions of the emitted fragments. With these kind of measurement, the neutron-to-proton ratio of the fragments can also be obtained, which is an observable extremely sensitive to the shell structure effects, as it has been shown in previous experiments within the same campaign.
In the latest experiment of this campaign, a study of high-energy fission and 238U beam and a series of light targets was carried out by quasi-fission between a using the aforementioned technique, in order to probe the role of the shell structure in these processes. This contribution will be focused on the latest results and on the ongoing analysis of the yields of the fragment mass and charge distributions, as well as of the neutron-to-proton ratio, and their link with possible structure effects.

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