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Stability of K-isomeric states against fission

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In the last two decades, many isomeric states have been discovered and studied in the region of deformed heavy nuclei with proton and neutron numbers around Z=100 and N=152, respectively [1]. Among these, so-called K-isomeric states [1-3], which formed by coupling of up to several quasiparticles, are of especial interest. In three nuclei ^{270}Ds [4], ^{250}No [5-7], and ^{254}Rf [8], high K isomeric states that are more stable than the respective ground states have been found. Accordingly, K isomeric states, which have extra stability against fission are one of the intriguing topics in both experimental and theoretical study of the superheavy nuclei (SHN).

Theoretically, an effect of the K number on fission is described within various models (e.g., [9-10]) in which results are often lead to or represented an increase of the fission-barrier height compared to that of the ground-state. Such results, indeed, qualitatively describe the extra fission stability of the isomeric state. However, still no quantitative estimates on fission half-lives of various K isomeric states in various SHN are exist. This is related to the complexity of the fission-process description.

In this talk, I will discuss a fission-hindrance due to K quantum number within a recently suggested semi-empirical approach, which had shown to be reasonably effective for descriptions of the electron-capture delayed fission [12] and the spontaneous fission [13]. Estimations on the fission half-lives of excited and high-K states in the SHN will be shown.

For completeness of the topic, I will present experimental results [14-15] on the study of K isomeric states at the gas-filled recoil separator TASCA of the SHE-Chemistry department (GSI).

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