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Electron-captured delayed fission in the heaviest nuclei

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Radioactive decays of the heaviest nuclei provide unique information's on the limit for existence of the matter. In this regards, the subsequent decays of the heaviest elements leads to the production of the most stable isotopes of the elements that exist in the nature. A special interest is the so called beta/electron captured (EC)-delayed fission process. EC delayed fission (ECDF) is a two-step process where first mother odd-odd nucleus undergoes EC decay and form an excited daughter even-even ones which directly fission instead of surviving. Despite termination, ECDF has a great impact on the understanding of nature, e.g., isotopic distribution of the astrophysics processes, gives an access to fission from excited states, etc..

Presently, more than 30 cases of ECDF in the isotopes of elements Tl, Bi, At, Fr, Np, Am, Bk, Es and Md are known. ECDF process often quantified by its probability (P_{ECDF}), expressed as a ratio of numbers of initial EC decay and subsequent fission from the excited states of the daughter nucleus, which is still poorly describable by theories. Therefore, the experimental P_{ECDF} values have mostly been used in the theory either for extraction of the fission barrier heights or suggestive ECDF half-lives. These approaches lead to interesting results, which help to accumulate the knowledge on ECDF process. Despite these valuable results, still no conclusive picture/view on ECDF that provides a quantitative description of the experimental PECDF values is yet given. Accordingly, theoretical predictions of the yet unknown cases of the ECDF in wide ranges of Z and N do not exist yet.

I will present, a semi-empirical estimate on ECDF probabilities of nuclei with Z=79-119 by inferring the theoretical Q_{EC} and B_f.