Dynamical effects in the super-heavy mass region.

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The transfer-induced fission channel has been studied in the reaction ^{28}Si on ^{232}Th at 340 MeV bombarding energy, by using the 8πLP detector array at the XTU Tandem-Linac complex. The fission probabilities of TLF nuclei (P_f) have been determined as a function of the projectile charge (Z_{PLF}), as reported in the figure. The direct measure of fission probability of heavy nuclei that lie, like in the present case, in the mass region of heavy and super-heavy elements is useful to establish the optimal conditions for the synthesis of these exotic nuclear species. As shown in the figure, the statistical model predictions of the code PACE2 (solid line) are severely overestimating the fission probabilities of TLF nuclei with atomic number Z = 90 - 96, suggesting a sizable survival probability of TLF nuclei against fission.

Pre-scission and post-scission multiplicities of neutrons and alpha particles have been also simultaneously measured for fission-like reactions of $^{260}Rf_{104}$ nuclei, formed in the fusion of ^{28}Si on ^{232}Th. The dynamical fission delay is a key factor in the population of nuclei in the super-heavy region. From a comparison of the Statistical Model predictions with measured pre-scission neutron multiplicities, the fission delay have been estimated to be 5^{+7}_{-3} x 10^{-20}s, which overlaps with the average duration of fission-like process as determine from HICOL dynamical calculations. For the same delay time the pre-scission alpha particle multiplicity from PACE2 is about a factor two larger than the experimental one, demonstrating the difficulties in modelling the alpha particle emission from highly elongated shapes.