STUDY OF THE FORMATION OF SUPERHAEVY ELEMENT Z=122 VIA TWO ENTRANCE CHANNELS

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This work on the superheavy element (SHE) Z=122, with the mass number A=306, is inspired by the results of recent experiments on producing the nuclides ^{283}112, $^{287,\,298}$114, ^{283}116 and ^{293}118. Using the Dynamical Cluster-decay Model (DCM), we have studied two reactions forming the same compound nucleus ^{306}122, but the available experimental data for fusion-fission (ff) and quasi-fission (qf) cross sections is only for ^{58}Fe+^{248}Cm→^{306}122 reaction, given at one compound nucleus (CN) excitation energy E*≈33 MeV. The other reaction at the same excitation energy is ^{64}Ni+^{242}Pu→ ^{306}122.

The DCM, worked out in terms of mass fragmentation coordinate $\eta = (A_1-A_2)/(A_1+A_2)$ and the relative separation R, define the CN decay or the fragments production cross section for ℓ partial waves as

$$\sigma_{(A_1,A_2)}(E_{c.m.},\theta_i,\Phi) = \frac{\pi}{k^2}\sum_{\ell=0}^{\ell_{max}}(2\ell+1)P_0P; \qquad k=\sqrt{\frac{2\mu E_{c.m.}}{\hbar^2}}$$

Here P_0 is the pre-formation probability of each fragment, calculated as the solution of stationary Schrödinger equation in η, and P, the penetration probability, calculated as the WKB integral. In our first calculation, here we have estimated the fusion-fission cross sections, with the cross sections of light particles (LPs), the evaporation residue cross-section σ_{ER} predicted. Important parameter of DCM is the neck-length parameter ΔR which varies with the temperature. The calculated fusion-fission cross section for ^{58}Fe-induced reaction at the best fitted ΔR is $\sigma_{ff}^{Cal.}$=1.214 mb, compared with $\sigma_{ff}^{Expt.}$= 1.616 mb, and for ^{64}Ni-induced reaction, at the same ΔR, we get $\sigma_{ff}^{Cal.}$=1.138 mb. We are looking forward to check the experimental expectations for ^{64}Ni-induced reaction that the contribution of quasi-fission grows as compared to the more asymmetric ^{58}Fe-induced reaction.