EXPERIMENTAL EVIDENCE OF NON-COMPOUND NUCLEAR PROCESSES IN NEAR SUPER-HEAVY NUCLEUS ^{256}RF THROUGH NEUTRON MULTIPLICITY MEASUREMENTS

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Synthesis of super-heavy elements (SHE) by bombarding a heavy target nucleus with a heavy projectile is a prominent topic in nuclear physics in the recent years. In collisions between two heavy nuclei, it is a well known fact that there is a considerable contribution from quasi-fission (QF) processes along with the fusion-fission (FF) processes. A number of reaction probes such as fission fragment mass distribution (MD), mass-energy distribution (MED) and mass-gated neutron multiplicity have been adopted to disentangle these processes. For such studies, neutron emission is one of the preferable probes as it helps in measuring time-scales of these processes and in understanding the mechanism of energy dissipation in heavy-ion reactions. With this motivation, we have measured mass-gated neutron multiplicity for the ^{48}Ti+^{208}Pb reaction (E^*=56.5 MeV) populating the near super-heavy compound nucleus ^{256}Rf using the National Array of Neutron Detectors (NAND) facility at Inter University Accelerator Centre (IUAC), New Delhi. In the present work, we are reporting results for neutron multiplicity corresponding to symmetric and asymmetric mass cut in fission fragment mass distribution. It is observed that pre-scission neutron multiplicity increases from value of 1.79±0.10 to 2.26±0.07 as we go from asymmetric to symmetric mass region. This increase is attributed to difference in reaction mechanism and timescale of FF and QF processes. Statistical model calculations however are unable to reproduce the experimental multiplicities which indicate that non-equilibrium (transients) processes for the highly fissile compound system together with non-compound nuclear processes possibly play an important role for such heavy systems.