Effect of Entrance Channel Parameters on Incomplete Fusion Reactions

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The study of low heavy ion induced fusion reactions has been a topic of great significance even at energies slightly above coulomb barrier. Recent studies report that, not only are both complete fusion (CF) and incomplete fusion (ICF) reactions possible at these energies,the two forms of reactions are, in fact, the most dominant reaction mechanisms. In CF reactions, the projectile completely fuses with the target nucleus. The projectile and the target nucleus form a single excited complex system, which may eventually become a fully equilibrated compound nucleus (CN). At later stages,the CN de-excites via the emission of light nuclear particles and/or γ - rays. In contrast, in ICF reactions, only a part of the projectile fuses with the target nucleus, leading to the formation of an excited incompletely fused composite system with a mass and/or charge lower than that of the CN, while the remaining part escapes in forward cone with approximately the beam velocity.The unexpected show up of ICF at slightly above coulomb barrier has been justified as the natural extension of fusion due to excess input angular momenta imparted in to the system in non-central collisions.

In the proposed talk, for better understanding of ICF reaction dynamics, attempt has been made to present the study on the onset and strength of ICF in terms of various entrance channel parameters that includes projectile energy, mass – asymmetry of interacting partners α – Q value of the projectile and input ℓ values. The experiments have been performed at Inter University Accelerator Centre (IUAC) New Delhi INDIA using General Purpose Scattering Chamber (GPSC) having in-vacuum transfer facility of targets. The well established Stacked foil activation technique followed by off-line γ - ray spectroscopy was used for the measurements. The percentage ICF fraction for different projectile target combinations deduced from experimentally measured excitation functions of individual reaction products shows strong dependence on projectile energy, mass-asymmetry of interacting partners and α-Q value of the projectile. The details of the work will be presented at the time of conference.