Complete and Incomplete Fusion in the Reaction of ^{16}O with ^{74}Ge

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There has been a considerable interest in the study of complete fusion (CF) and incomplete fusion (ICF) in the heavy ion induced reaction at the projectile energy range between 5-10 MeV/nucleon. The mechanism of ICF reactions is still not clearly understood particularly with regards to the angular momentum involved in the process. ICF particularly be considered as a process in which the projectile breaks up into two fragments, near the surface of a target nucleus, one of which escapes with relatively unchanged velocity while the other fuses with the target to form an excited composite system, which subsequently de-excites in the usual way, by particle evaporation. In the process of ICF, linear momentum of the entrance channel is not transformed completely to the composite system. In the present work, excitation functions of the evaporation residues produced in ^{16}O induced reactions on enriched ^{74}Ge isotope (enrichment 98.9%) have been measured by activation technique, at twelve energies between 60.2 and 111.6 MeV. Targets of various thickness between 80-270 μg/cm^2 were made by vacuum evaporation technique an aluminum backing of 1.14 mg/cm^2 . The experiment has been performed at VECC Heavy Ion Accelerator Facility, Kolkata (India). The irradiation was performed by keeping the target assembly normal to the beam facing the sample ^{74}Ge. The aluminum backing serves the purpose of catcher foil to trap the recoiling nucleus as well as energy degrader. γ-activities were recorded by a 100cm^3 HPGe detector, coupled to PC based data acquisition system at VECC.

Some of the measured excitation functions which have been reported here are: ^{74}Ge(^{16}O, 4n)^{86}Zr, ^{74}Ge(^{16}O, p4n)^{85}Y, ^{74}Ge(^{16}O, 2α3n)^{79}Kr, ^{74}Ge(^{16}O, α3n)^{83}Sr and ^{74}Ge(^{16}O, αp2n)^{83}Rb. In order to see the contribution of CF the measured EFs have been analyzed with the theoretical predictions of code ALICE-91. This code does not take into account ICF process and hence deviation of the measured EFs from theoretical calculations may be attributed to the presence of ICF process. The reactions ^{74}Ge(^{16}O, 4n)^{86}Zr, ^{74}Ge(^{16}O, p4n)^{85}Y and ^{74}Ge(^{16}O,2α3n)^{79}Kr seem to take place through CF process, while the reactions ^{74}Ge(^{16}O, α3n)^{83}Sr and ^{74}Ge(^{16}O,αp2n)^{83}Rb show the presence of ICF process along with CF process, especially at higher projectile energies.

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