THE ROLE OF TRANSFER AND ENTRANCE CHANNEL IN THE FUSION CROSS-SECTION AND MEAN ANGULAR MOMENTUM FOR $^{46}Ti+^{64}Ni$; $^{50}Ti+^{60}Ni$ AND $^{19}F+^{93}Nb$ IN THE BARRIER REGION

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There have been several measurements of fusion cross-sections around the coulomb barrier for various compound systems. They generally indicate a varying degree of enhancement in the experimental cross-sections at energies below the coulomb barrier, relative to the predictions of one-dimensional barrier penetration model (1-D BPM). Mechanism underlying the observed enhancement of fusion below the coulomb barrier has been described mainly by using the coupled channel approach[1]. To understand the role of transfer channel in the enhancement of the fusion cross-sections at sub-barrier energies, the fusion measurements for $^{46}Ti + ^{64}Ni$ and $^{50}Ti + ^{60}Ni$ systems leading to the same compound nucleus ^{110}Sn have been performed. The ground state transfer Q-values are quite different for the two systems. For $^{46}Ti + ^{64}Ni$ system the ground state Q-value of 2n-pickup is ~ +4 MeV, whereas for $^{50}Ti + ^{60}Ni$ system it is ~ - 6.2 MeV. Measurements on the near and sub-barrier fusion cross-sections of very asymmetric $^{19}F + ^{93}Nb$ system have also been performed in order to investigate the influence of entrance channel mass asymmetry in the fusion process. Few nucleon transfer probabilities were also measured for this system at sub-barrier energies. This fusion data has been compared with near symmetric entrance channel of $^{48}Ti + ^{64}Ni$ leading to the identical compound nucleus ^{112}Sn. The above experiments were performed with $^{46,50}Ti$ and ^{19}F beams provided by the 15UD Pelletron accelerator facility at the Nuclear Science Centre (NSC), New Delhi. The recoil mass separator at NSC viz., Heavy Ion Reaction Analyzer (HIRA)[2] was used for the identification of the various evaporation residues. The 1-D BPM and simple coupled channel calculations, coupling the lowest inelastic excited states (2^+ and 3^- of both the target and projectile) and transfer probabilities have been done. From the above barrier data the barrier parameters have been extracted and compared with the systematics. The results of absolute efficiency of ER detection by HIRA, the absolute fusion cross-sections and the derivation of mean angular momenta from the measured cross-sections will be presented in the conference.

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References

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