FUSION CROSS-SECTION AND SPIN DISTRIBUTION MEASUREMENTS IN $^{32,34}S + ^{109}Ag$ AND $^{48}Ti + ^{93}Nb$ SYSTEMS AROUND COULOMB BARRIER

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The enhancement in the sub-barrier fusion cross-section over the one-dimensional barrier penetration model predictions is explained by various models taking into account coupling of inelastic and/or transfer channels to relative motion, deformation of projectile/target, neck formation, etc. The validity of the model requires not only the sub-barrier fusion cross-section (ie. the zeroth moment of spin distribution) to be reproduced but also higher moments of the spin distribution to be simultaneously explained. In addition, spin distribution measurements can be a sensitive tool to look for possible entrance channel effects in the fusion process. There are only a few systems in which both these measurements are performed yielding mixed results as to the existence of entrance channel effects[1].

We have carried out simultaneous measurements of fusion cross-sections and spin distributions around Coulomb barrier for $^{32,34}S + ^{109}Ag$ and $^{48}Ti + ^{93}Nb$ systems in order to look for isotopic dependence and entrance channel effect using the beams delivered by 15 UD Pelletron accelerator at Nuclear Science Centre. The Heavy Ion Reaction Analyzer (HIRA)[2] was used to measure the fusion excitation function and to produce a clean and efficient fusion tag signal for gamma multiplicity detectors by the direct detection of the evaporation residues. The gamma multiplicity detector array consisted of 28 BGO detectors covering about 75% of total solid angle.. The efficiency and the cross-talk information for the BGO detectors were determined using the calibration sources (^{60}Co & ^{137}Cs) and were further checked by measuring the gamma fold distribution for the fission fragments from ^{252}Cf source. Multiplicity information is derived from the measured fold distribution using Monte Carlo simulation taking into account the measured efficiency and cross-talk values. The detailed results alongwith comparison with coupled channel calculations will be presented.

References

1) A Charlop et al, Phys. Rev. C, 49 (1994) 1235
2) A K Sinha et al, Nucl. Inst. Meth. A339 (1994) 543.

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