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Influence of coupling of excited states and of deuteron transfer on fusion reactions induced by ${}^6,7\text{Li}$ on ${}^{64}\text{Ni}$, ${}^{152}\text{Sm}$ and ${}^{209}\text{Bi}$ targets

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Abstract

Here, we present a comprehensive analysis of fusion reaction data induced by weakly bound nuclei ${}^6,7\text{Li}$ on medium and heavy mass targets ${}^{64}\text{Ni}$, ${}^{152}\text{Sm}$ and ${}^{209}\text{Bi}$ at around Coulomb barrier energies within the framework of coupled channel method. Particularly, the influence of coupling of various excited states of the colliding nuclei and the deuteron transfer effects on fusion excitation function have been investigated. It is found that the inclusion of coupling effects leads to an enhancement up to 74% in fusion reaction cross section in close vicinity of Coulomb barrier when compared with one dimensional barrier penetration model predictions. However the inclusion of deuteron transfer effects reduces this enhancement up to 23% in below barrier region while up to 36% in above barrier energy region and reproduces the data reasonably well.

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