Fusion Reactions of Some Medium Systems by employingSemiclassical and Quantum Treatments

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Abstract: The semiclassical Coupled-Channels calculations for the medium systems ^{6}Li+^{64}Ni, ^{6}He+^{64}Zn and ^{16}O+^{62}Ni are discussed. The total fusion reaction cross section σ_{fus}, and the fusion barrier distribution $D_{fus}$for these systems has been calculated using a semiclassical approach based on the method of Alder and Winther for Coulomb excitation. The results obtained from our semiclassical calculations are compared with the available experimental data and with a full quantum Coupled-Channels calculations. The $(X^2)$for the case of no coupling and coupling effects included shows clearly that the present semiclassical calculations are more consistent with the experimental data than the full quantum mechanical calculations.

Keywords:Semiclassical treatment, Quantum treatment, Medium systems, The coupled channel.

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