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Role of repulsive interactions in sub-barrier fusion cross sections

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Abstract

An attempt has been made to modify the original version of the Aage Winther 1995 (AW95) potential by adding a positive Gaussian part as $V_{\text{Rexp}}(-br^2)$ to investigate the effect of the repulsive core on the sub-barrier fusion cross sections. In order to achieve this goal, we select and evaluate 6 heavy ion fusion reactions with $392 \leq Z_1 Z_2 \leq 784$ (including $^{58}\text{Ni}+^{54}\text{Fe}$, $^{58}\text{Ni}+^{58}\text{Ni}$, $^{64}\text{Ni}+^{64}\text{Ni}$, $^{16}\text{O}+^{208}\text{Pb}$, $^{28}\text{Si}+^{64}\text{Ni}$, $^{28}\text{Si}+^{100}\text{Mo}$). The obtained results reveal that the original version of the AW potential supplemented with Gaussian positive part successfully reproduces the experimental fusion excitation data for various considered systems.

Keywords: Heavy ion fusion reactions, Proximity formalism, Coupled-channels calculations, Fusion cross section

For full article, refer to the Persian section