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Study of neutron-rich nuclei reaction using ImQMD model

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Abstract

In the present study, the fusion reactions induced by neutron-rich nuclei have been investigated using the improved quantum molecular-dynamics (ImQMD) model. First, the accuracy of the results was explored using a set of parameters IQ3a for $^{16}\text{O}+^{92}\text{Zr}$, $^{40}\text{Ca}+^{46}\text{Ti}$ and $^{16}\text{O}+^{154}\text{Sm}$ fusion excitation functions. The obtained results revealed that the measured fusion excitation function could be reasonably well reproduced. A comparison was also performed with the theoretical results based on the coupled-channel calculations. Then, the time evolution of densities for the $^{16}\text{O}+^{59}\text{Co}$ and $^{32}\text{S}+^{92}\text{Zr}$ reactions in which the target nuclei were neutron-rich were studied and the fusion cross sections were calculated dynamically. It was found that the fusion cross sections of these reactions at energies around the Coulomb barrier could be well reproduced by using the ImQMD model.

Keywords: neutron-rich nuclei, ImQMD dynamic model, coupling model, fusion cross section, Skyrme force.

For full article, refer to the Persian section