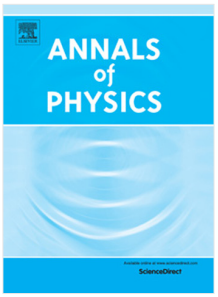
Accepted Manuscript



Analysis of heavy-ion fusion reactions using new parameterized form of the universal function of nuclear proximity potential

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PII: S0003-4916(18)30245-8
DOI: https://doi.org/10.1016/j.aop.2018.09.006
Reference: YAPHY 67755

To appear in: *Annals of Physics*

Received date : 12 July 2018
Accepted date : 16 September 2018

Please cite this article as: R. Gharaei, Analysis of heavy-ion fusion reactions using new parameterized form of the universal function of nuclear proximity potential, *Annals of Physics* (2018), https://doi.org/10.1016/j.aop.2018.09.006

Analysis of heavy-ion fusion reactions using new parameterized form of the universal function of nuclear proximity potential

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Abstract

In the present work, we modify the original version of this formalism (Prox. 77) using a new analytical form of the universal function which is formulated based on the double-folding model with three density-dependent versions of the M3Y-type interactions, namely DDM3Y1, CDM3Y3 and BDM3Y1, for 46 fusion systems with condition $48 \leq Z_1 Z_2 \leq 2460$ for charge product of their participant nuclei. It is found that when the Prox. 77 potential is accompanied by each of the formulated universal functions, the agreement between the theoretical and experimental data of the fusion barrier heights increase for our selected systems. The obtained results of this study reveal that the saturation property of cold nuclear matter plays a key role in the calculations of the fusion cross sections. We conclude that the Prox. 77 model with universal function based on the BDM3Y1 interactions provides the best results for fusion barrier heights and cross sections. On the basis of the prox. 77(BDM3Y1) potential model, we present the parameterized formulas for fusion barrier heights V_B and positions R_B. These formulas can calculate the values of R_B and V_B with good accuracy in comparison with the experimental data. A comparison is also presented among the theoretical results of the present work and those obtained by the modified form of the original version of proximity approach through the universal function and surface energy coefficients available in the literature.

PACS number(s): 25.70.Jj, 24.10.-i

Keywords: Heavy-ion fusion reactions; density-dependent interactions; universal function; proximity formalism.

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