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Effects of velocity-dependent terms in the Skyrme functional on fusion barrier

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The Skyrme energy density functional have applied to calculate the nucleus-nucleus interaction potentials for sub-barrier fusion reactions within the framework of double-folding model. It is shown that the calculated potential is sensitive to the velocity-dependent terms in the Skyrme EDF. To accurately capture the height of the Coulomb barrier, it is essential to amplify the contribution from the velocity-dependent terms. A new set of Skyrme functional parameters is proposed that significantly enhances the description of both the height and position of the Coulomb barrier. The new set also provides a reliable representation of nuclear ground-state properties, including binding energies and charge radii.

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