Limits of double folding potentials to simulate the polarization in reactions involving halo projectile and heavy target

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So far, the approach of using double folding potentials and investigating the energy dependence of their strength factors at near barrier energies has been successfully used for systems with stable weakly bound projectiles. The reason for this success may be the small strength of the long range tail of the polarization potential produced by the breakup channel when halo nuclei are not involved and the breakup threshold energy is not too small [1]. Comparative studies of the energy dependence of the nuclear optical potential for the systems ^{6,7}Li + ^{27}Al have been performed [2,3] by using the three approaches, including the double folding potential for the real and imaginary parts of the optical potential, the Wood-Saxon form-factors for both parts of the optical potential, and real part from double folding potential and imaginary of the Wood saxon form. The results were very similar. Concerning the analysis of the elastic scattering of systems involving halo or neutron skin projectiles by using double folding potentials, so far only the investigation of the ^{6}He + ^{27}Al system has been reported [4]. The aim of this work is to show the limitation of using double folding potentials to describe elastic scattering angular distributions, to derive realistic total reaction cross sections, or to simulate dynamic polarization potentials due to breakup, for systems with halo or neutron skin projectiles, specially those with heavy targets, when Coulomb interactions are very strong. For this purpose, we investigate the energy dependence of the optical potential for the ^{6}He + ^{209}Bi system at energies near and below the Coulomb barrier.

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