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Systematics of reaction cross sections and geometrical parameters from double folding and single folding optical potentials

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At the moment a hot topic of research is the description of the residual-nucleus-target part of knockout reactions from exotic projectiles with large differences in the valence neutron-proton separation energies. Comparing a large set of theoretical and experimental reaction cross-sections, for some light projectiles on a 9Be, we provide a quantitative assessment of the description of the core-target part of knockout reactions.
We also show that a single-folded (s.f.) (light-) nucleus-9Be imaginary
optical potential is more accurate than a double-folded (d.f) optical potential. Within the eikonal formalism for the cross sections and phase shifts, the single-folded potential is obtained using a n-9Be phenomenological optical potential and microscopic projectile densities. Our results show that the (s.f.) cross sections are larger than the (d.f.) cross sections and the effect increases with the target mass. Furthermore the strong absorption radius parameter extracted from the S matrices of (s.f.) results has a stable value rs =1.3 - 1.4 fm for all target masses and a very small dependence on the asymmetry of the valence neutron and proton separation energies in the projectile. This indicates that a clear geometrical separation can be made between the region of surface quasi elastic reactions and the region of strong absorption into other channels because of which the residual nucleus will not survive intact. The (d.f.) results are instead much scattered and the separation between surface reactions and other channel is not consistent.

Topic

Theory

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