BG9600437

Nuclear Surface Localization of Preequilibrium Reactions at Low Energies

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Average quantities related to the characteristics of the nucleon-nucleon (NN) interaction along the trajectory of the projectile in preequilibrium reactions are calculated by using the semiclassical method to follow the incoming particle's path in the nuclear target. The radial dependences of the nucleon's mean free path and the probability for the first NN collision have pointed out the surface character of the first NN interaction in multistep reactions even at low energies. In the local density approximation an average Fermi energy and an average strength of the effective NN interaction $\overline{V}_0$ along the trajectory of the incident nucleon are obtained with respect to both the nuclear density and the first NN-collision probability. A good agreement is found between the average strengths obtained with the Hartree-Fock potential plus the dispersive component and by using the parametrization based on the Brueckner-Hartree-Fock nuclear matter calculations. It is also shown that the nuclear-density dependence of the effective NN interaction may account for the low-energy phenomenological V_0-values which are much more increased in comparison with any predictions.

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BG9600438

The Dependence of the Nuclear Charge Form Factor on Short Range Correlations and Surface Fluctuation Effects

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We investigate the effects of fluctuations of the nuclear surface on the harmonic oscillator elastic charge form factor of light nuclei, while simultaneously approximating the short-range correlations through a Jastrow correlation factor. Inclusion of surface-fluctuation effects within this description, by truncating the cluster expansion at the two-body part, is found to improve somewhat the fit to the elastic charge form-factor of ^{16}O and ^{40}Ca. However, the convergence of the cluster expansion is expected to deteriorate. An additional finding is that the surface-fluctuation correlations produce a drastic change in the asymptotic behavior of the point-proton form factor, which now falls off quite slowly (i.e. as $const. \cdot q^{-4}$) at large values of the momentum transfer q.

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