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# Microscopic nuclear optical potentials: new developments and achievements

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The optical potential is a well-established and widely used tool to describe nucleon-nucleus scattering processes. Within this approach, it is possible to compute the scattering observables for elastic processes across a wide region of the nuclear landscape and extend its usage to inelastic scattering and other types of reactions.

Since phenomenological approaches lack predictive power, we strongly believe that a microscopic approach will be the preferred tool to make reliable predictions, in particular for upcoming experiments concerning exotic nuclei.

The Watson multiple scattering theory provides a successful framework to derive such optical potential for intermediate energies. In its simplest formulation, derived at the first order, the optical potential is obtained as the folding integral of the nucleon-nucleon scattering matrix and the target density, representing the two fundamental ingredients of the model. After many years of advances in theoretical nuclear physics, it is now possible to calculate these two quantities using the same nucleon-nucleon interaction that is the only input of our calculations. Results obtained within this framework will be presented for light- and medium-mass nuclei, adopting different ab initio approaches to calculate the densities, such as No-Core Shell Model and Self-Consistent Green's Function. Novel extensions of the model, such as the calculation of inelastic transitions or nucleus-nucleus collisions will be also presented.

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