Full Folding Model for Optical Potentials

H.F. Arellano and F.A. Brieva

Departamento de Física, Facultad de Ciencias Físicas y Matemáticas
Universitad de Chile, Casilla 487–3, Santiago, Chile

The development of the full folding model has set new standards for detailed microscopic calculations of nucleon–nucleus scattering. Based on realistic nucleon–nucleon interactions, this model samples the explicit off–shell behavior and the intrinsic energy dependence of the effective internucleon force in the nuclear medium as driven by the Fermi motion of the target nucleons. As a result, we have a reliable parameter–free framework to calculate with reasonable accuracy nucleon–nucleus scattering observables in the 20–500 MeV energy range. In this paper we present the foundations of the full folding model and discuss its scope and limitations. Results from calculations of differential cross sections and spin observables for proton elastic scattering from light and heavy nuclei will be presented and compared to available data. The predicting power of the theory is also explored with calculations of total cross sections for neutron scattering from nuclei as a function of the projectile energy. Furthemore, we shall discuss the sensitivity of the full folding results to different choices of realistic internucleon interactions. In particular, we present recent developments based on the use of quantum inversion potentials constructed directly from nucleon–nucleon phase–shift data. Results suggest that it is possible to establish a meaningful link between nucleon–nucleon and nucleon–nucleus phenomena.