Multiband coupling and nuclear softness in dispersive Lane-consistent optical model for actinides

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This work presents the current state of a consistently developing coupled channels optical model. It takes into account the dispersive relations for the energy dependent optical potential [1], providing more constraint and realistic predictions. Lane-consistent (isospin symmetric) form [2] of the potential allows using the same parameter set for an unified description of direct neutron and proton scattering, and (p,n)-reactions.

Recent development of the model considers optical potential of a soft deformed target nucleus as an axially deformed potential with linear corrections corresponding to softness and non-axiality of a nucleus [3]. This approach allows coupling to levels from different rotational bands providing good convergence of calculations. Finally, a soft rotator model for even-even nuclei was used to calculate “effective” deformations – matrix elements of quadrupole and octupole deformation operators – with Hamiltonian parameters obtained from low-lying excitations spectrum of a nucleus [4]. Although the soft rotator model does not describe an odd-A nucleus excitations, “effective” deformations may be estimated for levels in rotational bands based on excitation of an even-even core of the nucleus. Therefore, multiband coupling, nucleus stretching, and some other corrections are accounted for actinides [5].

The presented model allows construction of a regional optical potential for actinides with low number of fitting parameters and good description of available experimental data.

References:

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