Soft Rotator Multiband Optical Model Parameters for Fissile Actinides

Martyanov D.[1], Capote R.[2], Quesada J.M.[3], Chiba S.[4]

[1]*Joint Institute for Power and Nuclear Research, 220109, Minsk-Sosny, Belarus*
[2]*NAPC–Nuclear Data Section, International Atomic Energy Agency, Vienna A-1400, Austria*
[3]*Departamento de Física Atómica, Molecular y Nuclear, Universidad de Sevilla, E-41080 Sevilla, Spain*
[4]*Laboratory for Advanced Nuclear Energy, Institute of Innovative Research, Tokyo Institute of Technology, Japan*

The recently developed multiband dispersive optical model with soft rotator nuclear model couplings is used to build a regional potential for fissile actinides. The model allows coupled-channel calculations for odd-A targets considering rotational bands built on vibrational states. Those complex vibrational states are characterized by a coupling of single-particle excitations with the vibrational states of the corresponding even-even core.

We studied fissile targets U-233, U-235, Pu-239, and Pu-241 and derive optical model parameters to predict “optical” cross section data. For U-233, the ENSDF database identifies two bands (beta- and octupole vibrations), one band for Pu-239 and one band for Pu241 (octupole). For U235 no such bands are found, however the new model can predict cross sections in this case due to the inclusion of the centrifugal stretching effect across the ground state rotational band.

Experimental data on nucleon scattering from U-233, U-235 and Pu-239 are described using this model as implemented in the OPTMAN code with four nuclear deformations as fitting parameters. Optical predictions for U-235m and Pu-241 are also studied.
Derived optical model potentials are being used elsewhere for on-going INDEN evaluations of neutron induced reactions on Pu-239 and U-233 targets.