Development of a Coupled-Channels Optical Model Code "OPTMAN" and a Global CC Potential as a Base for High-energy Nuclear Data Evaluation

Efrem Sh. SOUKHOVITSKI[1,*], Satoshi CHIBA[2]

[1] *Joint Institute of Energy and Nuclear Research-Sosny, Academician A.K. Krasin str. 99, 220109, Minsk, Belarus*

[2] *Japan Atomic Energy Research Institute, Tokai, Naka, Ibaraki 319-1195, Japan*

Coupled-channels optical model code "OPTMAN"[1)] was completely modernized to satisfy the demands of high-energy nuclear data evaluation. By incorporating a new potential form, consistent with the dispersion relationship as proposed by Delaroche *et al.*,[2)] high-energy saturation properties of the Dirac phenomenology, Lane model with the Coulomb correction term proportional to the derivative of the real potential, and a relativistic generalization, our approach can be applied from low energy ($\sim$ keV) to about 200 MeV for both of neutron and proton induced reactions with a simple dependence on A and E.

Necessary Soft-rotator nuclear Hamiltonian parameters of even-even nuclides in the mass region considered were found by describing observed low-lying collective levels as members of the G. S.; K=2$^+$; n_{β_2}=1, K=0$^+$ and K=0$^-$ negative parity bands. This made possible determination of individual optical potential parameters allowing best fit of available experimental data both for neutrons and protons simultaneously, by using search option of code OPTMAN. In cases when experimental data is available for one probe or is very scares, such an approach allows extrapolation of the results obtained for one probe to the other. The prediction can be much more reliable when experimental data for both neutrons and protons are available. We found that all the available experimental optical data (total cross sections, S- and P-wave strength functions, scattering radii, angular distributions of elastically and inelastically scattered nucleons and reaction cross sections) for nuclides with A=24-122 can be described with good accuracy using optical potential with the smooth A-dependencies of potential values, radii and difusenesses, while individual properties of the nuclides are accounted by individuality of the nuclear Hamiltonian parameters, Fermi energies and deformations. The latter in most cases were found to be equal for neutrons and protons, except for single-closed-shell nuclei: ^{52}Cr, ^{54}Fe, ^{58,60,62}Ni, ^{90}Zr, ^{92}Mo and ^{116,118,120,122}Sn. For these nuclei, deformations allowing best fit are greater for the probe for which the corresponding shell is closed. This feature is consistent with the nuclear theory predictions, predicting difference proportional to the isovector $(N-Z)/A$ term[3)] and thus may be significant in nuclear data predictions for neutron rich nuclides appearing in nucleosynthesis.

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* Corresponding author, Tel. +375-17-299-4935, Fax. +375-17-299-4712, E-mail: esukhov@sosny.bas-net.by