GLOBAL OPTICAL MODEL POTENTIALS FOR THE ELASTIC SCATTERING OF $^{6,7}$Li PROJECTILES

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The phenomenological optical potential, $U$, is defined as

$$U(r, E) = -V_r(r, E) - iW_r(r, E) + V_c(r),$$

(1)

where $V_r$ and $W_r$ are the real and imaginary components of the volume-central potentials, respectively. $E$ is the laboratory energy of the incident particle in MeV. All components are separated in $E$-dependent well depths, $V_r$, $W_r$, and energy-independent radial parts $f$, namely

$$V_r(r, E) = V_r(E) f(r, R_v, a_v),$$

$$W_r(r, E) = W_r(E) f(r, R_w, a_w).$$

(2)

As usual, the form factor $f(r, R, a)$ is a Woods–Saxon shape

$$f(r, R, a) = (1 + \exp\left[(r - R)/a\right])^{-1},$$

(3)

where, with $A$ being the atomic mass number, the geometry parameters are the radius $R$ and the diffuseness parameters $a$.

$^{6}$Li OMP Parameterization

The global $^{6}$Li-nucleus optical model potential for $24 \leq A \leq 208$ and $13 \leq E \leq 156$ MeV is given by the following formulas.

Real central potential:

$$V_r = 109.5 \text{ (MeV)}$$

$$R_v = 1.326A^{1/3} \text{ fm},$$

$$a_v = 0.811 \text{ fm}.$$  

Imaginary central potential:

$$W_r = 58.16 - 0.328A + 0.00075A^2 \text{ (MeV)}$$

$$R_v = 1.534A^{1/3} \text{ fm},$$

$$a_v = 0.884 \text{ fm}.$$  

Coulomb potential radius:

$$R_c = 1.3A^{1/3} \text{ fm}.$$  

$^{7}$Li OMP Parameterization

The global $^{7}$Li-nucleus optical model potential for $24 \leq A \leq 208$ and $28 \leq E \leq 88$ MeV is given by the following formulas.
Real central potential:

\[ V_r = 114.2, \text{ (MeV)} \]
\[ R_v = 1.286 A^{1/3} \text{ fm}, \]
\[ a_v = 0.853 \text{ fm}. \]

Imaginary central potential:

\[ W_v = 40.13 - 0.341 A + 0.00093 A^2, \text{ (MeV)} \]
\[ R_v = 1.739 A^{1/3} \text{ fm}, \]
\[ a_v = 0.809 \text{ fm}. \]

Coulomb potential radius:

\[ R_c = 1.3 A^{1/3} \text{ fm}. \]