

Study of the interaction of 6,7Li with the 28Si nucleus at low energies

This paper presents the results of a joint analysis of the experimental Data: angular distributions (AD) of elastic scattering and reactions total cross sections (σ_R) of the Interaction of 6,7Li ions with 28Si nuclei at (7.5 – 32) MeV energies. Calculations were carried out in the framework of the deformed optical potential (OP) using SPI-GENOA program.

Calculated values of σ_R on 28Si reproduce well the experimental trend of a slight decrease with increasing energy of projectile 6,7Li in the energy range $E = 15 - 55$ MeV/A. In the sub-barrier region for 6,7Li trend sharp decrease of σ_R with decreasing E-values in the range of 10 MeV/A to sub-barrier energies. However, due to lack of measured data σ_R at near-barrier energies difficult to estimate how occur they change depending on the energy E and the mechanism of this phenomenon. Therefore, is very relevant – getting experimental σ_R for reactions (6,7Li + 28Si) at low energies.

We obtained the linear dependence of the OP parameters of energy 6,7Li:

for 6Li+28Si: $V=123.4764+0.890165 \bullet E$; $aV=0.73358+0.004429 \bullet E$; $WS=0.37432+0.15244 \bullet E$;

$aS=0.73415+0.00451 \bullet E$; $WD=12.4971+0.123044 \bullet E$; $aD=0.84399+0.000850 \bullet E$.

for 7Li+28Si: $V=104.227+2.6557 \bullet E$; $aV=0.6199+0.01741 \bullet E$; $WS=4.5639-0.2121 \bullet E$;

$aS=0.41197+0.031086 \bullet E$; $WD=10.482+0.3303 \bullet E$; $aD=0.8123+0.004 \bullet E$,

where the values of V, WS, WD and energy E are expressed in MeV, and the diffuseness aV, aS, aD in fm.

Comparison and analysis of the data shows: for (7Li + 28Si) – experimental σ_R not measured at energies above 30 MeV/A, and for (6Li + 28Si) – at energies above 55 MeV/A. From comparative analysis of trends of experimental σ_R found: for (6,7Li + 28Si) with increasing energy in the range from 10 to 30 MeV/A are as follows: for 7Li – experimental σ_R virtually unchanged (stable with $\sigma_R \approx 1600$ mb), and for 6Li – with increasing energy experimental σ_R gradually decreased from 1650 mb to 1350 mb.

Note that there are no experimental data of direct measurements of the reactions total cross sections at energies from Coulomb barrier (Bc) to 10 MeV/A – for 6Li, and 15 MeV/A – for 7Li.

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