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Potential Description of alpha+208ˆPb Elastic Scattering

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The last two decades have seen the considerable success of non-monotonic (NM) and modified single-folded (MSF) potentials in describing the alpha-induced elastic scattering and non-elastic processes which exhibit a distinctive feature of anomaly in large angle scattering (ALAS). The ALAS effect cannot be explained by the Woods-Saxon type of optical model (OM) potential in a consistent manner. This work reports the analyses of the experimental angular distributions of alpha+208ˆPb elastic scattering in terms of two types of OM potentials, namely the complex NM and modified form of single-folded potentials. Two sets of real NM potentials have been found through the analysis of the data, which are termed as set-1 and set-2 potentials. The closeness of the fits to the data using set-1 potential with unshifted repulsive core and set-2 potential with shifted repulsive core suggests that the effect of the potential shape in the central region of the target 208Pb nucleus is not that significant in determining the angular distribution of cross-sections at low incident energies and the scattering is dominated by the nuclear potential at the nuclear surface. The MSF potential, without any renormalization, satisfactorily describes the alpha+208ˆPb elastic scattering data for the energies considered here. The number of nucleons making alph-like clusters is deduced as 4A_α=180 and the number of unclustered nucleons found is A_N=28. The rms radius of the target 208ˆPb has also been deduced.

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