Conference on physics of tandem. Trieste, Italy, 27-30 April 1976

CEA-CONF--3595

FR76 03146

SURFACE TRANSPARENCY OF OPTICAL POTENTIALS INDUCED BY HEAVY-IONS SCATTERING STUDIES

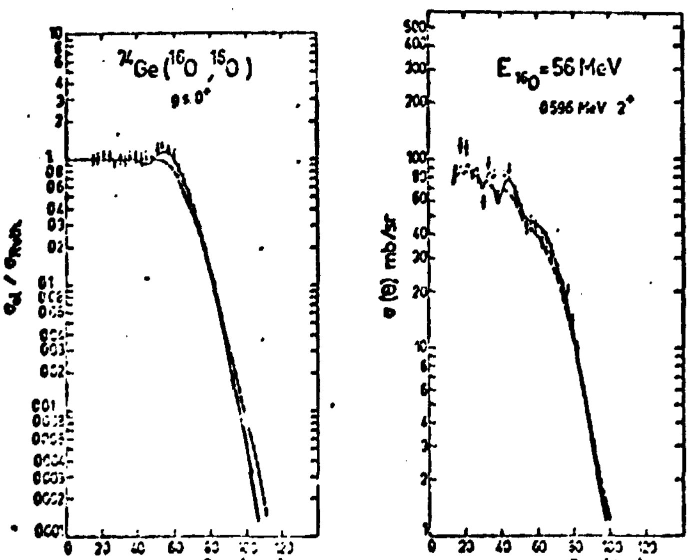
N. Lisbona†, M.E. Cobern††, M.C. Mermaz, J.C. Peng and A. Greiner

Département de Physique Nucléaire
CEN SACLAY, BP2, 91190, Gif-sur-Yvette, France.

In order to determine appropriate optical potentials for heavy-ion induced reactions, the elastic and inelastic cross-sections of $^{16,18}O$ and ^{12}C scattered from targets of even-even Ge and Ni isotopes have been measured over an angular range 12.5° to 100° (laboratory angle) at $E_{^{16,18}O} = 56$ MeV and $E_{^{12}C} = 48$ MeV. By simultaneously fitting the angular distributions for the ground state (0^+) and first-excited level (2^+), optical potentials have been determined. This analysis has been performed using the coupled channel automatic search code ECIS-73 of J. Raynal which adjusts the parameters of the optical model potential to minimize the quantity χ^2 defined as

$$\chi^2 = \frac{1}{N} \sum_{i=1}^{N} \left[\frac{\sigma_{exp}(\theta_i) - \sigma_{th}(\theta_i)}{\Delta\,\sigma_{exp}(\theta_i)}\right]^2$$

simultaneously for both elastic and inelastic data. This method allowed us to reduce the continuous ambiguities in the determination of the potentials which are now fixed almost uniquely. The optical potentials so obtained exhibit two characteristic features : (i) the well depth of the imaginary potential is larger than the well depth of the real potential and (ii) the radius and diffuseness of the imaginary potential are respectively smaller than those of the real potential. It turns out that such surface transparency is necessary to reproduce the experimental data and that no optical potential with equal geometries gives as good a fit. This is illustrated in the figure where the solide curves correspond to the best fits using surface transparent potential while the dashed curves are the best fits obtained by imposing equal geometries on the real and imaginary potentials.



It is also interesting to note that the deflection function corresponding to surface transparent potentials displays a significant minimum at the grazing angular momentum.

† Conselho Nacional de Desenvolvimento Científico e Tecnológico, Rio de Janeiro, Brasil.

†† Tandem Accelerator Laboratory, University of Pensylvania, Philadelphia, PA 19174.