A Study of the ^{90}Zr(p,t)^{88}Zr Reaction

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The ^{90}Zr(p,t)^{88}Zr experiment has been carried out using the 26 MeV proton beam from the Garching HVEC MP Tandem, the long focal plane detector for light ions and the Q3D magnetic spectrograph. The experimental reaction data have been previously reported [1].

The experimental angular distributions have been analyzed using a double-folding procedure to calculate the real part of the triton-nucleus potential in the framework of the model of Kobos et al. [2].

The potential is described by

$$U_F(\vec{r}) \;=\; \lambda \int d\vec{r}_1 \int d\vec{r}_2 \rho_T(\vec{r}_1)\rho_t(\vec{r}_2)t(E,\rho_T,\rho_t,\vec{s})$$

where $\vec{s} = \vec{r} + \vec{r_2} - \vec{r_1}$, $\vec{r}$ is the separation of the centers of mass of the target nucleus and the triton, $\rho_T(\vec{r}_1)$ and $\rho_t(\vec{r}_2)$ are the respective nucleon densities, and λ is an overall normalization factor. The effective nucleon-nucleon interaction t calculated in nuclear matter from the Bonn potential and parameterised in terms of a local density- and energy-dependent two-body interaction [3] is used. The target nucleus density distribution ρ_T was the experimental one [4] obtained from electron scattering and unfolded from the finite-charge distribution of the proton. A Gaussian form [5] for the density distribution of the triton, and a volume Woods-Saxon potential for the imaginary part have been used.

The DWBA calculations have been made in the finite-range approximation with a cluster form-factor, using the computer code DWUCK5 [6]. The angular distribution of the ground-state transition was fitted with the code TROMF [7], which allows a simultaneous fit to both the elastic-scattering data in the entrance and exit channels and the reaction data [8].

For the proton channel the experimental data from Van Der Bijl et al. [9] at $E_p = 25.05$ MeV have been used, and for the triton channel the experimental data from Hardekopf et al. [10] for 15 MeV triton elastic scattering from ^{90}Zr have been used.

As shown in fig. 1 the fit to the experimental data is rather good.

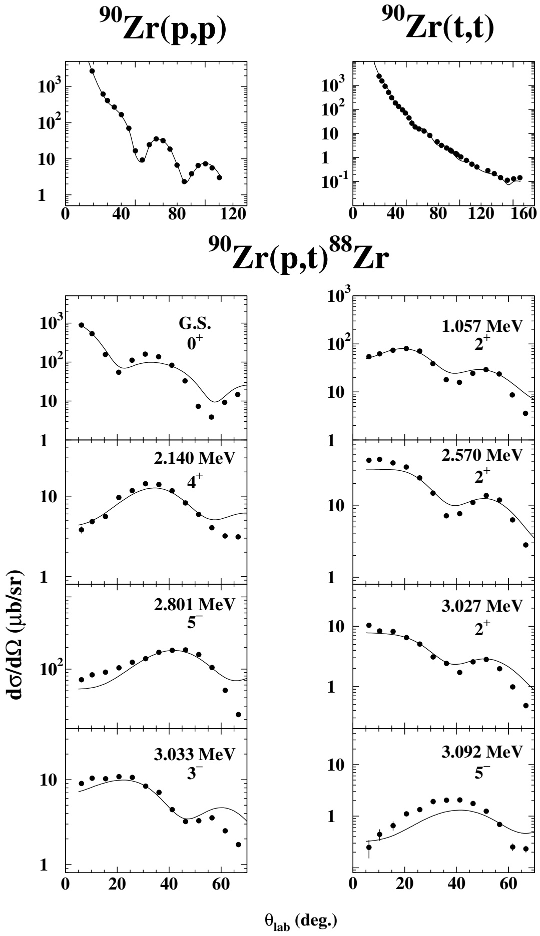

Fig. 1: The results of the fitting procedure with respect to the elastic scattering data, for the entrance and exit channels, are shown together with the angular distributions for some ^{88}Zr levels, compared with the calculations performed using Double-Folded triton potential.

References

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