

NEUTRON TRANSFER IN THE REACTION ${}^9\text{Be}({}^9\text{Be}, {}^8\text{Be}){}^{10}\text{Be}$
AT 10 MeV C.M. ENERGY

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The measurements were performed by means of tandem accelerator of ETH, Zurich. At forward angles ${}^8\text{Be}$ ions were detected in a counter's pair as two α -particles from the ${}^8\text{Be}$ decay in coincidence. At the middle and backward angles, where energy of emitted ${}^8\text{Be}$ ions becomes low, the ejectile-recoil nucleus coincidence technique was applied. The absolute normalization of the cross section was obtained from a comparison with elastic scattering of ${}^9\text{Be}$ on ${}^9\text{Be}$ ³.

Theoretical calculations of the transfer reaction were performed with the aid of the finite-range DWBA code SATURN-MARS of Tamura and Low¹. Because of the identity of ions in incident channel the symmetrization of T-amplitude was performed according to formula given by Goldberger and Watson². A few optical model potentials which describe elastic data of ${}^9\text{Be}$ on ${}^9\text{Be}$ at 10 MeV c.m. energy were used to generate distorted waves (table I). Optical model parameters of ${}^8\text{Be} + {}^{10}\text{Be}$ were assumed the same as for the ${}^9\text{Be} + {}^9\text{Be}$ channel.

Table I Optical model parameters ($R_1=r_1(A_1^{1/3}+A_2^{1/3})$)

	V	τ_V	α_V	W	τ_W	α_W	W_S	τ_S	α_S	τ_C	χ^2/N
1	60.	1.193	0.6	32.6	1.193	0.6	—	—	—	1.193	3.347
2	49.884	1.139	0.664	14.103	1.081	0.174	11.210	1.139	0.664	1.139	2.809
3	70.66	1.04	0.731	24.287	1.315	0.580	—	—	—	1.193	2.012

In the figure 1. the experimental angular distribution of ${}^9\text{Be}({}^9\text{Be}, {}^8\text{Be}){}^{10}\text{Be}$ is compared with theoretical calculations.

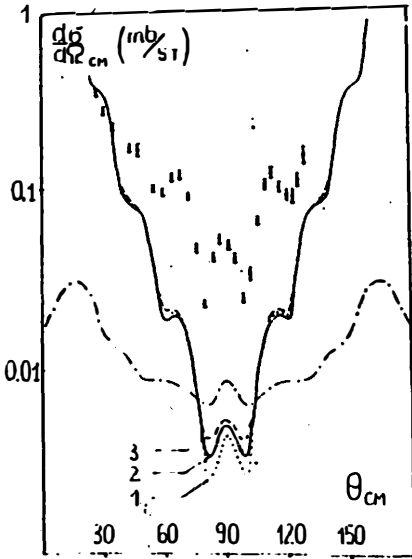


Fig.1. Angular distribution of ${}^9\text{Be}({}^9\text{Be}, {}^8\text{Be}){}^{10}\text{Be}$.

Geometrical parameters of the binding potentials both for ${}^8\text{Be}_{g.s.} + n$ and ${}^9\text{Be}_{g.s.} + n$ were chosen the same as in the reference ⁴. The depth of the central part of this potential was adjusted to obtain the appropriate binding energy. The spectroscopic amplitudes were taken from Cohen and Kurath ⁵.

Agreement for very forward angles confirms the theoretical predictions of spectroscopic factors. Calculations of transfer with various optical model potentials differ only slightly at the middle angles.

The contribution of compound cross section was estimated using the parameters of the Hauser-Feshbach model fixed by the analysis of p,d,t data for 7 MeV c.m. ⁶. This contribution is shown in the figure 1. as dash-dotted line.

It is easily seen that there is impossible to explain entirely the slope of the experimental data by means of compound cross section contribution. Too big slope of the theoretical curves could be connected with specific features of ${}^9\text{Be}$ e.g. a big quadrupol moment or/and very small neutron binding energy (1.665 MeV) leading to coupling with break-up channel ⁷.

1. T.Tamura, K.S.Low, Comp. Phys. Commun. 8(1974)349.
2. M.L.Golberger, K.M.Watson, Collision Theory (1964).
3. E.Ungricht et al., Nucl. Phys. A313(1979)376.
4. J.Lang et al., Phys. Rev. G16(1977)1448.
5. S.Cohen, D.Kurath, Nucl. Phys. A101(1976)1.
6. to be published.
7. I.J.Thompson, M.A.Nagarajan, Phys. Lett. 106B(1981)163.