

MULTI-NUCLEON TRANSFER INTERACTIONS FOR $^{14}\text{N}(108 \text{ MeV}) + ^{24}\text{Mg}$ SYSTEM IN A
DYNAMICAL TREATMENT

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The measurements of nucleon transfer reactions in ($^{14}\text{N} + ^{24}\text{Mg}$) system have been performed at the Kurchatov Institute [1]. The energy spectra of $Z = 5-8$ reaction products show broad bell shape corresponding to large energy dissipation.

To analyze the experimental data it is considered that a dinuclear system is formed, its time evolution being described by three collective variables: r - the distance between centers-of-mass of the two nuclei, θ - the deflection angle and x - the mass-asymmetry [2,3]. Using a proximity nuclear potential with parameters: $r_0 = 0.90 \text{ fm}$ and $V_0 = -20 \text{ MeV}$ and the friction tensor with coefficients: $c_r = 5 \times 10^{-23} \text{ s/MeV}$, $c_\theta = 0.01 \times 10^{-23} \text{ s/MeV}$ and $\gamma_{xx} = 10,000 \text{ s.MeV}$, the value of the critical angular momentum for fusion, $l_{c,f} = 32\hbar$ was obtained, in agreement with that deduced with the program SURPLUS [4]. The reaction cross-sections have been calculated supposing that at each time of the evolution of the collective degrees, the intrinsic degrees are in thermodynamical equilibrium. The temperature $T(t)$, characterizing the system of intrinsic degrees was determined from the excitation energy, by means of the energy dissipation on the radial component [3].

In fig. 1 the calculated cross-sections $d^2\sigma/d\theta dE$ corresponding to a mass transfer of 2 or 3 nucleons are compared to the experimental angular distributions for $Z = 5$ or 6 elements. A good estimation of the absolute values of the experimental reaction cross-sections is obtained without any normalization.

In fig.2, the calculated cross-sections $d^3\sigma/d\theta dE dA$, corresponding to a transfer of 2 and 3 nucleons are represented as Wilczynski plots. The calculated values reproduce the patterns of the experimental ones. We notice that at this incident energy $\approx 8 \text{ MeV/u}$, only the relaxed component is significant at large angles, different from the case of heavy systems [5] where both components are present in the Wilczynski representation.

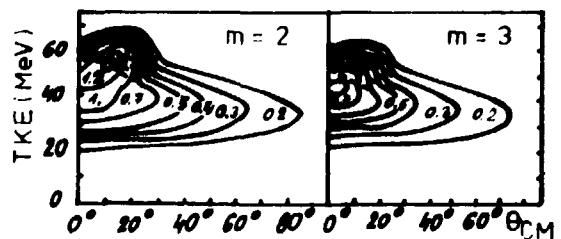
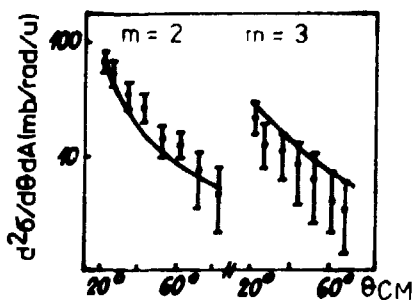


Fig.1. Calculated reaction cross-sections compared with experimental data

Fig.2. Calculated Wilczynski plots

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2. C.Igo: Proc.Brașov Int.School Romania (1980)
3. I.M.Brancuș et al.: Rev.Roum.Phys. 32, 733 (1987)
4. I.Soumijarvi et al.: Nuov.Cim. 31A, 51 (1984)
5. I.M.Brancuș et al.: Z.Phys. A320, 443 (1985)