# CONSTRAINED PHASE SPACE APPROACH TO THE $^{16}O+^{48}Ti$ REACTION

W.Trautmann, W.Dünnweber, W.Hering, C.Lauterbach, H.Puchta, R.Ritzka, W.Trombik

Sektion Physik, Universität München, D-8046 Garching, W.-Germany

Using various techniques we have studied the binary channels of the $^{16}O+^{48}Ti$ reaction at $E_{lab}$ = 100 MeV. Recent experiments include measurements of the double-differential cross section $d\sigma/d\Omega dE$ in the range $15° \leq \Theta_{lab} \leq 107°$, and of the circular polarization $P_\gamma$ of the deexcitation γ-rays in coincidence with light fragments (Fig.1), thus completing our picture of the reaction mechanism obtained from heavy-ion γ-ray coincidence experiments[1).]

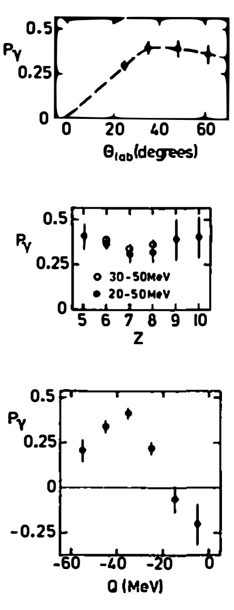


Fig.1: $P_\gamma$ vs. Θ,Z for DI events (top, middle) and $P_\gamma(Q)$, summed over $5 \leq Z \leq 10$ and angle (bottom).

We find that the projectile-like fragments from deep-inelastic reactions (Q < -20 MeV) are predominantly scattered to negative deflection angles and emerge little or not excited, whereas the highly excited heavy fragments carry angular momenta in accordance with the sticking prediction, and are well aligned with respect to the scattering normal[1)]. Deformations in the order of $\beta \cong 0.3$ must be assumed in order to account for the observed energy losses. From the measured cross section at backward angles and the reduced degree of polarization, as compared to the strong alignment, we conclude that a significant part of the cross section at large $|Q|$ is associated with orbiting trajectories ($\Theta > 180°$).

The classical-mechanical features of $^{16}O+^{48}Ti$ deep-inelastic reactions are reproduced by calculations within the friction model. In order to understand the statistical features we have adopted the constrained-phase-space approach, recently introduced to quasi-elastic heavy-ion scattering by Alhassid et al.[2]. We find that the assumption of a single constraint, concerning <E>, is sufficient to explain the widths of the measured energy spectra. The quality of the fit, however, strongly depends on the assumed relation of the transferred spin, I, vs. Q (Fig.2). The characteristic Q dependence of the alignment[1] is qualitatively reproduced if only angular momentum degrees of freedom are taken into consideration and if a single constraint, concerning $\langle M_z \rangle$, is assumed. Here $\langle M_z \rangle$ was chosen in such a way that the calculated spin transfer I agrees with the measured value[1].

In general, a qualitative success of this approach should be considered rather satisfying since the use of <E> and $\langle M_z \rangle$ as constraints is suggested by the sticking picture.

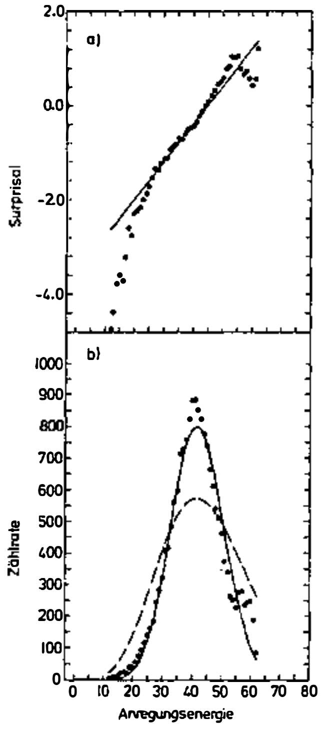


Fig.2: Surprisal and corresponding energy spectra assuming I=const (dashed) and the experimental I(Q) from Ref.1 (full line).

References

1) H.Puchta et al., Phys.Rev.Lett. 43 (1979) 623
2) Y. Alhassid et al., Phys.Rev. C20 (1979) 1789