

INTERMEDIATE MECHANISMS IN THE FISSION-LIKE FRAGMENTATION
OF A \leq 100 NUCLEAR SYSTEMS

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Experimental studies of ^{32}S -induced collisions on A=50-89 target nuclei, at bombarding energies of (4-7) MeV/nucleon, have shown the existence of reaction mechanisms intermediate (IM) between deep-inelastic collisions (DIC) and fusion-fission (FF) processes¹⁻³.

The fission-like fragmentation of the composite systems formed in such reactions exhibit the following characteristics: i) fragment mean kinetic energies close to the exit channel Coulomb barrier (i.e. characteristic of a fully damped process); ii) fragment mass distributions showing an evolution from symmetric (around half the composite system mass, $A_{CS}/2$) to asymmetric shapes, with changing the mass of the system¹, the entrance-channel mass asymmetry², the bombarding energy and the observation angle³.

Attempts to interpret those data within the framework of the "fast fission" or "extra-push" models have not been so far successful⁴. The possibility of explaining the observed evolution of the mass spectra, in terms of a diffusive relaxation process, has been investigated through dynamical model calculations⁵. In this approach, the time evolution of a rotating dinuclear system is followed until it decays statistically by fragmentation⁶; the relaxation of the system degrees of freedom is evaluated step-by-step employing a recent formulation of the transport theory which includes angular momentum effects explicitly⁷. The results of the present calculations for the $^{32}\text{S}+^{59}\text{Co}^3$ and $^{32}\text{S}+^{76}\text{Ge}^2$ reactions are displayed in fig. 1 and compared to the experimental mass spectra. A fairly good agreement is achieved for these systems which exhibit quite different behaviours: the experimental mass distributions show an evolution with the observation angle for the former, whereas symmetric and angle-independent mass spectra (FF-like) are observed for the latter. With the present dynamical model it is thus possible to interpret experimental data reflecting different stages of the mass equilibration process characteristic of IM.

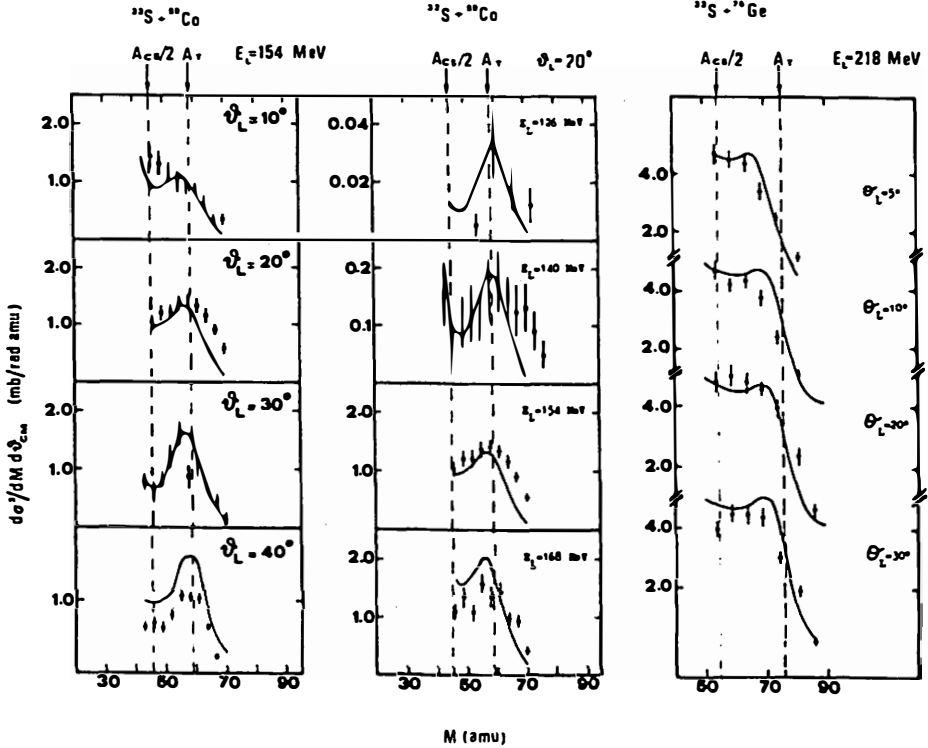


Fig. 1. - Comparison between calculated (curves) and experimental mass distributions for the fission-like fragmentation of the $^{32}\text{S}+^{59}\text{Co}$ and $^{32}\text{S}+^{76}\text{Ge}$ systems.

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