

SYMMETRIC FRAGMENTATION OF THE $^{32}\text{S} + ^{76}\text{Ge}$ SYSTEM
STUDIED BETWEEN 4.9 AND 7.0 MeV/u

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This work deals with the study of the symmetric fragmentation (fission) following heavy-ion collisions, with respect to the formation (or not) of a compound nucleus and its decay properties.

Mass and energy of the outgoing fragments resulting from the bombardment of ^{76}Ge with ^{32}S ions ($E(^{32}\text{S}) = 158, 178, 198, 218, 225$ MeV) have

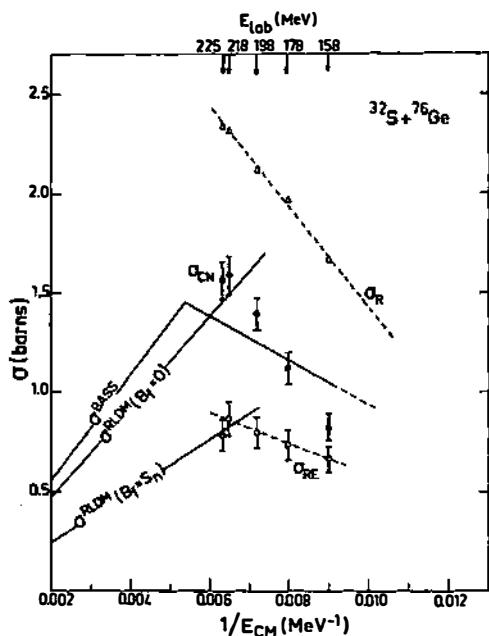


Fig. 1 : Measured cross sections as a function of $1/E_{CM}$. The solid lines indicate calculated upper limits on the total fusion (σ_{CN}) and evaporation (σ_{RE}) cross sections ; measured reaction cross sections (σ_R) are also given.

been determined by means of a time-of-flight spectrometer at the 16 MV upgraded Strasbourg MP tandem accelerator. Absolute cross sections and detailed mass and energy distributions of relaxed products were obtained as a function of the incident energies and for different angles. In all these measurements, a clear cut separation exists between deep inelastic and other relaxed components.

Numerous features of the resulting data show characteristics typical of a fusion-fission process : All observed events of fission-like products lie on a line corresponding to the Coulomb repulsion between two spheres ; the mass distributions are symmetric, centered on the half-mass of the $A_{CN} = 108$ system and have $1/\sin \theta$ angular distribution.

On other hand, specific characteristics do not favour a fusion mechanism. For instance, the complete excitation function σ_{FL} of the fission-like component cannot be reproduced with any single set of parameters by statistical evaporation calculations. Also, if one tentatively assumes (fig. 1) $\sigma_{CN} = \sigma_{FL} + \sigma_{RE}$, then Bass's limits ¹⁾ do not describe the results ; the fission becomes apparent well below the threshold predicted by the rotating liquid drop model ²⁾ ; the ratio σ_{CN}/σ_R does not decrease as the energy increases.

In order to describe the complete equilibration of the mass asymmetry degree of freedom, it seems necessary to include a long-lived deep inelastic contribution to the symmetric fragmentation, as calculated by Lejeune and Richert ³⁾ for neighbouring systems ⁴⁾. We would also like to remark that as we pass through the energy corresponding to zero fission barrier, no broadening of the mass distributions, as observed by Lebrun *et al.* ⁵⁾, was noted.

References

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