INVESTIGATION OF FAST FISSION IN THE $^{35}Cl + ^{238}U$ AT 240, 280 AND 320 MeV

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We have investigated the $^{35}Cl + ^{238}U$ system at 240, 280 and 320 MeV at the MPI post-accelerator in Heidelberg. We used seven independent solid state detectors to determine the energy of the fragments. The time microstructure of the beam allowed us to have a time-of-flight measurement between the target and the seven detectors and to calculate the mass of the fragments. The time resolution was about 150 ps. We used ^{252}Cf for energy calibration. We focused our attention on the symmetric fragmentation component which, for this system consists mainly of fast fission. To eliminate most of the three-body process (arising from the sequential fission of the quasi target) we have required the coincidence between the two fragments. The second fragment was detected in a parallel plate counter located close to the target at the expected correlation angle. In fig. 1 are shown two-mass distributions at 320 MeV with coincidence and without coincidence. We can see that the measured sequential fission cross section is quite large. Fig. 2 shows the FWHM of the coincidence mass distributions at different bombarding energy. We observe that it remains constant when the bombarding energy increases. This seems to be in contradiction with the results obtained for lighter targets where the FWHM increases a lot with the energy[1-3]). However such an effect has been observed in ref.[4]) for the $^{40}Ar + ^{238}U$ system although the mass distribution was spoiled by sequential fission. This effect may be related to an angular momentum dependence of the adiabatic potential energy surface governing the process which might go in the opposite direction compared to lighter systems. In fig. 3 the fusion cross section as a function of the inverse of the bombarding energy can be seen. We observe that a static calculation of fusion[5]) (full curve) underestimates the experimental result.

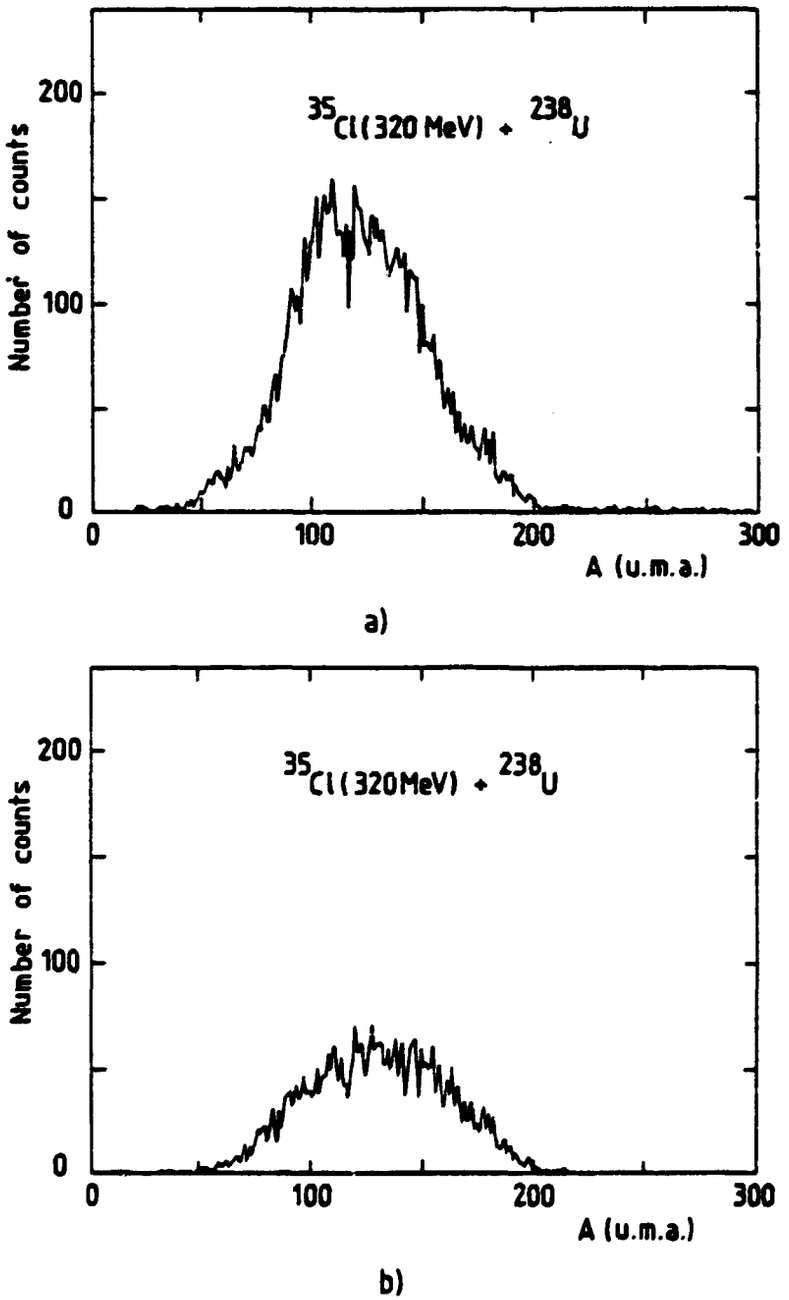

Fig. 1 - Mass distributions at 320 MeV : a) without coincidence ; b) with coincidence.

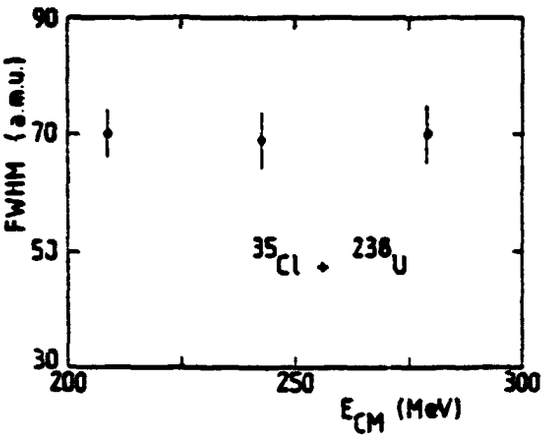

Fig. 2 - FWHM of the coincidence mass distributions as a function of the center of mass energy.

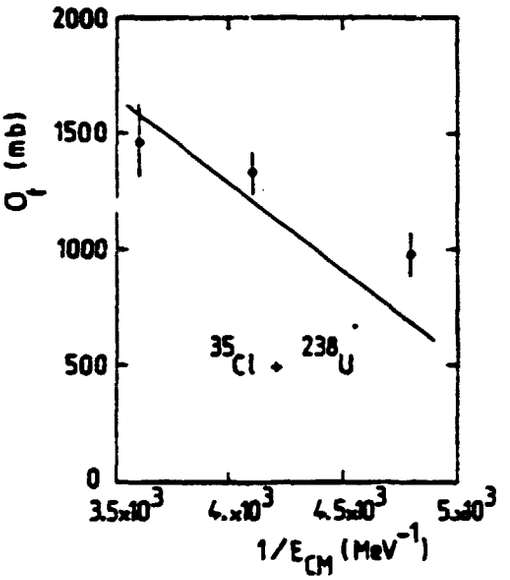

Fig. 3 - Fusion cross section as a function of the inverse of the center of mass energy. Full curve : static calculation for σ_f.

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