

FORMATION OF LARGE TARGET RESIDUES IN INTERMEDIATE
ENERGY NUCLEAR COLLISIONS

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We have used radiochemical techniques to measure the yields, angular distributions and velocity spectra of the large ($A_{\text{fragment}} \geq \frac{2}{3} A_{\text{target}}$) target residues from the fragmentation of ^{197}Au by intermediate energy ^{12}C , ^{20}Ne , ^{32}S , ^{40}Ar , ^{84}Kr and ^{139}La projectiles. The target residue moving frame angular distributions for the lighter projectiles (C-Ne) are not symmetric with respect to 90° , indicating the production of these fragments in a "fast", non-equilibrium process. The angular distributions for the reactions induced by 17 A MeV ^{32}S , 32 and 44 A MeV ^{40}Ar have similar characteristics. However, the heavy fragment angular distributions in the reaction of 35 A MeV ^{84}Kr with ^{197}Au are symmetric with respect to 90° , indicating the production of these fragments in a "slow" process, in which statistical equilibrium has been established.

The fragment energy spectra are consistent with this picture of an evolution in reaction mechanisms as the projectile size increases. The heavy fragment energy spectra have Maxwellian shapes ($T \sim 2.2$ MeV) in the Kr-induced reaction while the spectra are non-Maxwellian in the C-induced reactions.

We have attempted to calculate the yields and angular distributions of these fragments using a pre-equilibrium emission model involving a Boltzmann transport equation with appropriate modifications for Pauli blocking. While some success was achieved in predicting the shapes of these distributions, the neglect of peripheral collisions in the pre-equilibrium model prevents a detailed comparison of calculations and measurements.