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DISSOCIATION OF THE ^{12}C-α-^{12}C MOLECULE-LIKE CONFIGURATION

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Two series of experiments[1], carried out with the ^{16}O beam of the Tandem accelerator of Saclay, have shown the evidence of a linear arrangement ^{12}C-α-^{12}C in the ^{16}O + ^{12}C interaction. Both kinds of experiments make use of the specific configuration which involves an emission at rest of the α particle.

We develop this study in giving emphasize to the mechanism which takes place after nuclear separation. Complementary results about the detection of α particles at zero degree have been also collected between 40 and 70 MeV of ^{16}O onto ^{12}C.

The mechanism involved in the disintegration can be discussed by considering the yield of coincidence events in the detection of two ^{12}C's. For the sake of simplicity we show in Fig. 1 a typical case of symetric detection which allows to observe in (a), events with a missing mass of negligible energy (at most a few hundred of keV in the c.m. system). Larger α energies may also be measured simultaneously. However, it is worth noting that the only events which are really recorded are due to the emission of two ^{12}C's with nearly equal c.m. energies (a,b). Furthermore, along the line of symetry $E_{^{12}C} = E_{^{12}C'}$, there is a focusing effect when the α energy increases (the distribution in (b) is narrower than in (a)). These results are very well fitted by considering Coulomb rearrangements due to three-body Coulomb forces. In Fig. 2, we show the relevant Coulomb configurations as well as the resulting energy loci in the c.m. system. The experimental yield is simulated by dots in the upper part of the figure. This study shows that the α particle is probably ejected from the very central part of the system perpendicularly to the ^{12}C-^{12}C axis (analogy with ternary fission).

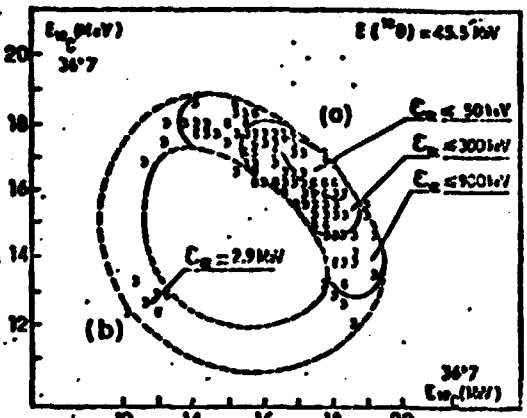

Fig. 1 : Density of coincidence events in the Lab. system

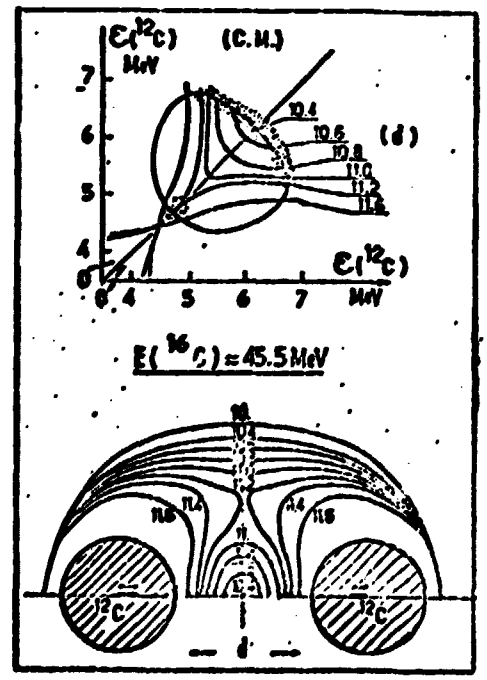

Fig. 2 : Coulomb configurations to fill with the α particle in order to preserve the available energy and the momenta. Critical values of d (fm) are necessary to find the α particle at the centre of symetry

Independently, α's detected at zero degree with only the c.m. velocity, exhibit a strong yield between 50 and 70 MeV, with a threshold at 45 MeV (35 MeV in ^{28}Si). As already mentioned[1], these events select the even spin values and are an original way of relating states of the system to its configuration when resonances occur.

REFERENCES

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