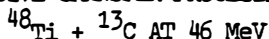


EVIDENCE FOR MASSIVE TRANSFER PROCESSES IN THE REACTION



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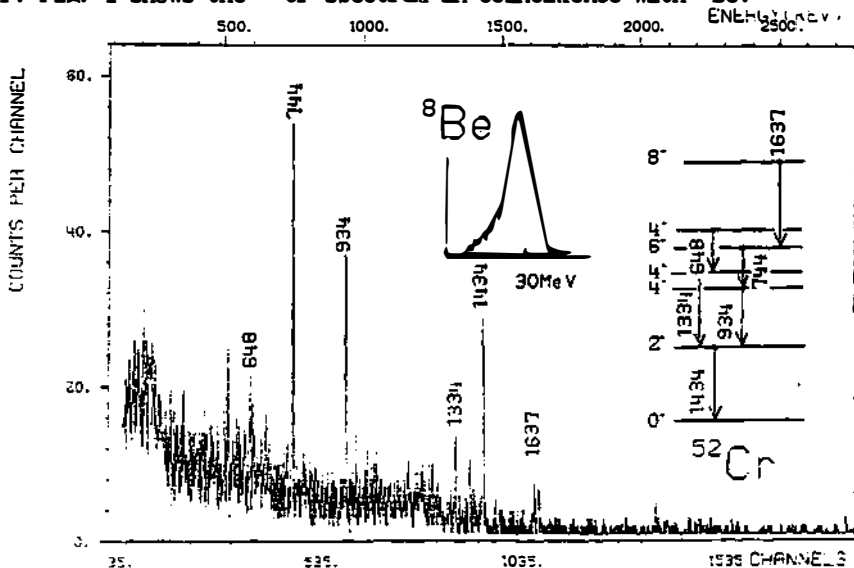
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It is expected¹⁾ that the dominant reaction mechanism for such target-projectile-energy combination is a fusion process with the formation of a ⁶¹Ni compound nucleus followed by the emission of n,p,α and γ. In a earlier experiment²⁾ we measured the absolute cross sections for the residual nuclei of this system and we found that the statistical theory of an equilibrated system can account in a first approximation for the data.

New experiments have been initiated to look if other processes can occur significantly, even at such low energy; they involve the selection of particles in coincidence with characteristic γ-rays of the de-excitation of individual residual nuclei. The ¹³C beam of the Saclay Tandem Van de Graaff bombarded a self supporting target of 400 μg/cm² of ⁴⁸Ti. The experimental arrangement included two telescopes placed symmetrically at ± 25° lab. The first (ΔE = 20 μm, E = 1 mm) in order to identify the particles from α to 0 and the second (ΔE = 50 μm, E = 3 mm) to detect light particles (p,d,t).

These two telescopes were in coincidence with a Ge detector (~ 20 % efficiency) placed at 135° lab. In another phase of the experiment, the two telescopes were placed at ± 135° and the Ge detector at 45°. Heavy particles from Li to O were detected only at forward angle. The γ spectra associated with these particles afford unique possibility to know what is the residual nucleus involved in the process.

Table 1 shows the observed coincidences. For example ⁵²Cr is likely to be produced by the reactions ⁴⁸Ti(¹³C,⁹Be) and (¹³C,⁸Be n). We do not observe the γ rays of ⁵³Cr from the reaction ⁴⁸Ti(¹³C,⁸Be)⁵³Cr although this channel is expected to have a large yield according to an extension of the diffractive model³⁾. We have thus to suppose the emission of a neutron to reach ⁵²Cr. Fig. 1 shows the ⁵²Cr spectrum in coincidence with ⁸Be.



Another point of interest is that the lower part of the Be spectrum (~ 14 MeV above the ground state of ^{52}Cr) is not associated with ^{52}Cr but is coincident with the γ spectrum of ^{51}Cr : this would suggest that a neutron is evaporated very early in the reaction by an excited ^{52}Cr nucleus.

The particle spectra coincident with γ rays reveal several possible paths to be considered ; they provide more information for the understanding of the reaction mechanism.

Table 1 : observed coincidences

COINCIDENCES	
particles	γ rays
^8Be (+ α)	^{52}Cr
^9Be	^{52}Cr ^{51}Cr
^{11}B	^{50}V
^{12}C	^{49}Ti
^{13}C	^{48}Ti
^{14}N	^{47}Sc
^{15}N	^{46}Sc

- 1) M. Lefort, Physica Scripta, 10A (1974) 101.
- 2) A. D'Onofrio. Thesis 1980 and to be published.
- 3) M.C. Mermaz, Phys. Rev. C21 (1980) 2356.

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