Université Scientifique et Médicale de Grenoble

INSTITUT DES SCIENCES NUCLÉAIRES
DE GRENOBLE

53, avenue des Martyrs – GRENOBLE

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CHARGED PARTICLE MULTIPLICITIES FROM 30 MeV/A ^{20}Ne INDUCED REACTIONS

R. Ost, A.J. Cole, A. Gamp, S. Kox, M. Longequeue, J. Menet, C. Perrin and J.B. Viano

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Charged Particle Multiplicities from 30 MeV/A ^{20}Ne induced Reactions

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At energies below 15 MeV/A compound nucleus formation and binary transfer reactions are the dominant mechanisms of heavy ion reactions. Events with more than two reaction products in the final channel are mainly due to particle evaporation from either the compound nucleus or a binary product excited above its particle threshold. Other emission modes are not observed with sufficient strength to draw stringent conclusions on the underlying mechanism. At higher energies other mechanisms should become stronger and more easily observable.

The 30 MeV/A ^{20}Ne beam of the Grenoble SARA accelerator has been used to bombard targets of ^{12}C, ^{27}Al, Fe and Zn. Particles with Z = 1 to 10 have been identified in 18 detectors located around the beam axis at angles < 8°. The great majority of multiplicity 2 events are two α-particles of near equal energy that are readily explained by break-up of ^{8}Be formed in a first reaction step. In addition α-particles are observed in coincidence with Z = 2 to 8. Fig. 1 shows the distribution of α-particles over 17 detectors with the coincident ^{16}O detected in detector 1. About half of the ^{16}O-α events are explained by α-evaporation from the first α-unbound state of inelastically scattered ^{20}Ne. For the explanation of the remaining events model calculations are still to be performed. No events have been observed where both particles have Z > 2.

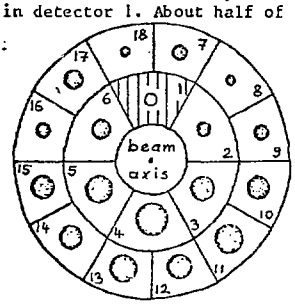

Fig. 1 : The surface of the circles is proportional to the α-counts

Less than 10 % of the multiplicity 3 events are candidates for a break-up of the projectile into three particles (^{12}C,α,α). In all other cases at least one of the three particles has a very low energy (evaporation from the target residue).