ANALYSIS OF 3-PRONGED EVENTS IN THE HEAVY ION INTERACTIONS OF Pb PROJECTILES WITH Au TARGETS USING MICA AND CN-85 DETECTORS.

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ABSTRACT

Two, three, four and five pronged events have been observed in the heavy ion interaction of $^{208}Pb + ^{197}Au$ using mica and CN-85 track detectors. The three dimensional track parameters of two and three pronged events have been measured. The binary events have been bifurcated into elastic and inelastic events by using Rutherford criterion. The elastic binary events and three pronged events, observed in the reaction, have been used for internal calibration to search out coefficients $C_{\mu\nu}$ of the velocity-range relation, in case of both the detectors, for the reaction under study. Using the three dimensional track parameters (lengths and angles) of events and employing the conservation of momentum and the velocity-range relationship the three pronged events have been analyzed. Using the knowledge of relative velocities of the fragments observed in final stage of the reaction intermediate stage of the reaction has been reconstructed. Knowing the intermediate stage masses and the final fragment masses, the mass transfer, total kinetic energy loss (TKEL) and scattering angles were determined.

Key Words: Three pronged, Heavy ions, Projectiles, Mica, Detectors.

INTRODUCTION

A charged particle traversing a track detector produces a latent damage trail along its path in the detector material. This trail can be revealed by proper etching and observed under an optical microscope. The track lengths and angles can be measured with the microscope. An early attempt to solve the problem by finding particle parameters (masses, energies etc.) from track parameters (lengths and angles) was made by (Ait-Saim, 1968) who determined the masses and energies of binary fission fragments in the reaction U^{nat} (n_{th}, f). Similarly (Remy, 1970) reported the conversion of individual tracks into masses and energies by using the theoretical velocity-range relation, in the case of three pronged events produced in the reaction of high energy protons with different heavy target elements. This approach has been followed in the later work of (Zamani e*t al.*, 1986). They used a calibration (known as external calibration) scheme based on the parameterization (Tripier, 1974). of theoretical velocity-range relation for certain detector materials. Dwivedi and Fielder (1988) has reported the determination of reaction parameters by assuming the validity of a general-purpose velocity-range program (Mukherji and Nayak ,1979). A completely different and more satisfactory method of calibration was evolved at Marburg (Gottschlk e*t al.*, 1983). In this method the track data of the reaction itself is used for the purpose of calibration. In the present work we have used the method developed by (Gottschalk *et al.*, 1983) for the analysis of multi-pronged events in the heavy ion reactions observed with SSNTDs.

EXPERIMENTAL DETAILS AND DATA COLLECTION

We have employed the 2π-geometry technique of SSNTD, the details of which have already been published in references (Gottschlk *at al.*, 1983 ; Brandt *et al.*, 1980; Vater e*t al.*, 1977)

Thin layers of the target material (^{197}Au) were vacuum deposited on clean and smoothed sheets of mica and CN-85. The target thickness on each sheet was determined by weighing the mica and CN-