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Study of (α, HI) reaction in a few light nuclei

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The available energy of the alpha particles from the Variable Energy Cyclotron is enough to initiate a Heavy Ion (HI) reaction on light nuclei. In order to recognise more exotic phenomena one should understand the basic features for a relatively simple projectile like alpha particle. In one of our earlier measurements (Ganguly *et al* 1987) we reported the results of ^{12}C (α, ^{5}Li) ^{11}B and ^{12}C (α, ^{6}Li) ^{10}B at E_α = 33.8 MeV and measured the differential cross sections. In order to have a thorough understanding of the reaction mechanism we have undertaken a systematic study of these α-induced HI reactions on ^{24}Mg, ^{27}Al and ^{28}Si.

As a first step in this direction the focus of the present work has been to measure the mass, energy and angular distributions for all the reaction products which are kinematically possible using Solid State Nuclear Track Detectors (SSNTD) to detect the emitted heavy ions.

A special type of scattering chamber attachment has been constructed to be used inside the main scattering chamber (Baliga and Bhattacharya 1986) of SINP, Calcutta.

The chamber consists of three concentric cylinders. The outermost one contains two holes of 4 mm diameter each for the inlet and outlet of the beam. The middle one of the three cylinders has vertically parallel slits of 2 mm width and 25 mm length. The cylinder can be rotated on ball bearings. In between the outermost and the middle cylinder two rings are designed to hold the SSNTD in the form of strips. To make the fixing of the detector strips easy and firm a number of small clips are provided. With this arrangement we can cover the whole angular region from 2° to 178° on both left and right hand sides of the chamber. Provision has also been made to place the surface barrier detectors by having openings on both sides at 30°.

In the innermost cylinder, slits are designed alternately on the upper and lower half of the cylinder so that any slit of the innermost cylinder can expose only half of a slit of the middle cylinder. On the outermost cylinder, at the beam entry

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side, a film coated with ZnS is fixed for guiding the beam into the chamber. Two electric relays fixed on top of the chamber give the necessary movements of the two cylinders. The movements of the cylinders are adjusted to fit the slits of the other cylinder.

Initial runs were carried out with alpha particles of $E_\alpha = 30$ MeV on ^{27}Al. The detectors after exposure were etched following the procedure given elsewhere (De *et al* 1989). The etched detectors are then scanned and we could see some heavy ions from the measured track diameters.

We plan to undertake the study of energy dependence and extend the studies to other targets also at an early date.

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