Elastic and inclusive alpha angular distribution for ^{6}Li+^{93}Nb system around the Coulomb barrier

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Introduction

Role of low breakup threshold on the reaction dynamics involving weakly bound nuclei has been the subject of current interest [1–4]. Recently a detailed study on nucleon transfer followed by breakup along with direct breakup for the ^{7}Li nuclei, bombarding it on medium mass target ^{93}Nb has been reported [5]. We aim to investigate the processes of direct breakup and nucleon transfer followed by breakup in detail for another weakly bound projectile ^{6}Li, which has relatively lower breakup threshold (1.47 MeV) with respect to ^{7}Li (2.47 MeV). In this contribution, we are reporting the Elastic scattering and inclusive-α angular distribution for the system ^{6}Li+^{93}Nb.

Experimental Details

The experiment was carried out at BARC-TIFR Pelletron LINAC Facility, Mumbai. ^{6}Li beam of energies 25 and 35 MeV were bombarded on self-supporting target of ^{93}Nb of thickness $\sim$2.0 mg/cm^2. For charged particle detection 5 DSSD (Double-sided Si strip detector) array was used. The detailed experimental set up is reported earlier [6] where preliminary analysis of elastic and alpha angular distribution was reported along with reactions populating unbound states for ^{6}Li+^{93}Nb system around the Coulomb barrier.

Analysis and Result

Elastic scattering angular distribution have been measured for the system ^{6}Li+^{93}Nb around the Coulomb barrier (V$_B\sim$ 18 MeV)
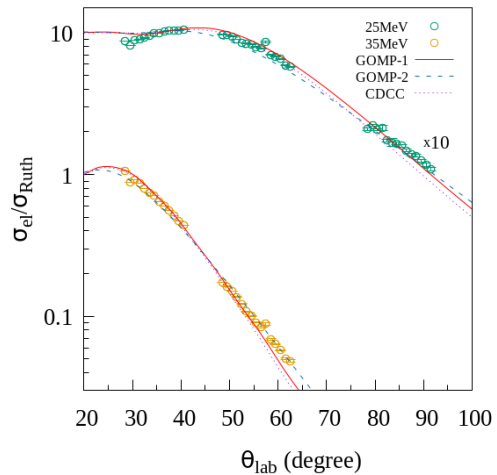

FIG. 1: Elastic scattering angular distribution for ^{6}Li+ ^{93}Nb at E$_{beam}$ = 25 MeV and 35 MeV. Solid line (GOMP-1) and dashed line (GOMP-2) corresponds to fit obtained from Global OM potential given by Cook [7] and Yongli *et al.* [8] respectively while dotted lines shows CDCC calculation.

at beam energies 25 and 35 MeV. In fig.1, open circles are the data from present measurements. Solid line and dashed lines corresponds to fit obtained from Global Optical Model (OM) potential given by Cook [7] and Yongli *et al.* [8] respectively while dotted lines shows continuum discretized coupled channels (CDCC) calculation using code FRESCO [9]. Cluster folding potentials were used as target-projectile interaction potentials.
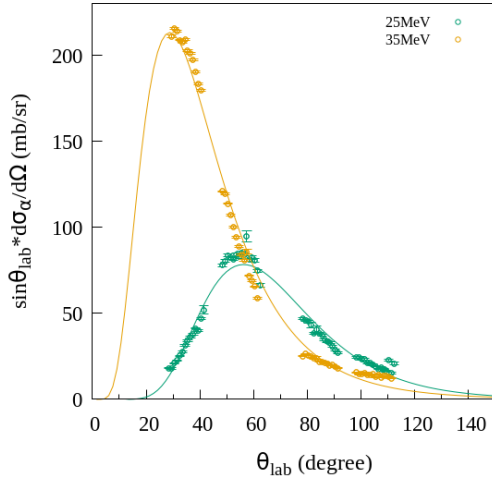Inclusive α angular distribution have also

FIG. 2: Inclusive α angular distribution for ^{6}Li+^{93}Nb at E_{beam} = 25 MeV and 35 MeV. Solid line corresponds to the lognormal fit for respective energies.

been measured for the same system at both the energies. Fig. 2 shows inclusive alpha angular distribution which is fitted with lognormal function using χ^2 minimization for each energy. The fitted curves are then used to obtain the angle integrated cross-section.

Reaction cross section are calculated using two different global optical model potentials [7, 8]. Table I shows Reaction and angle integrated inclusive alpha cross sections.

TABLE I: Calculated reaction cross sections using two different global optical potential parameters and inclusive α cross section for ^{6}Li+^{93}Nb system.

E_{beam} (MeV)	σ_{reac} (GOMP-1) (mb)	σ_{reac} (GOMP-2) (mb)	σ_α^{incl} (mb)
25	1035	1244	469
35	1684	1941	996

Summary

In summary, measured elastic scattering and inclusive-α angular distribution for ^{6}Li+^{93}Nb system at E_{beam} = 25 MeV and 35 MeV are presented. Global phenomenological optical model potential fit and CDCC calculations are carried out to understand the measured elastic scattering angular distributions. Further comparison between reaction cross section and inclusive α cross section shows α production as a major contributor in reaction cross section. Thus it will be interesting to study different reactions contributing to large α production cross section.

Acknowledgments

References

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