Investigating neutron transfer in the ^{6}Li + ^{124}Sn system

Introduction

- The investigation into mechanisms of reactions with weakly bound projectiles(WBPs) around Coulumb barrier energies has been a topic of intense interest in recent times.
- Lots of processes including elastic scattering, complete and incomplete fusion, inclusive and exclusive breakup, and transfer have been studied in reactions using WBPs.
- However, the role of combined breakup and transfer processes and the extent to which they influence other processes have not been understood well.

- Since The breakup process itself has been found to be predominantly triggered by nucleon transfer, the neutron transfer process is of particular interest.
- The neutron transfer process
- 1. May lead to enhanced breakup of the projectile nucleus
- 2. Is important in explaining the copious α production
- 3. Provide important coupling effects that may be necessary to explain the fusion behavior for systems at energies around the Coulomb barrier.
- 4. Help understand enhanced reaction and incomplete fusion cross sections.
- 5. Neutron transfer may provide additional fusion enhancement at below-barrier energies
- 6. Explain the suppression of the fusion cross sections at energies below the barrier
- 7. Is the dominant contribution to the ICF process in many systems

- The theoretical modeling of the process listed above is easier for noncapture breakup (NCBU) process and transfer to low-lying discrete states.

- For example, continuum discretized couple-channel (CDCC) and coupled reaction channel (CRC) calculations, can respectively be employed to describe these processes quite well.

- However, if the breakup process is followed by absorption of one of the fragments leading to breakup fusion or the transfer takes place to the high-lying states of the target both below and above the particle emission thresholds, the complexity increases.

- In the present work, the mechanisms of 1n stripping and pickup cross sections measured in the ^{6}Li + ^{124}Sn system have been investigated.
- CRC calculations have been performed to understand the mechanisms of both 1n stripping and 1n pickup reactions.
- To avoid the ambiguities with respect to the choice if optical model parameters in the calculations, the author employs a well-tested global set of potentials.
- CDCC calculations have been employed in estimation NCBU cross sections.
- A systematic behavior of 1n transfer data measured for various targets using ^{6}Li projectiles are also investigated in the article.