

## Study on the origin of $^{10}\text{B}$ in $^6\text{Li}+^{12}\text{C}$ reaction at energies around Coulomb barrier

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The weakly bound nuclei with relatively low binding energy and a greater breakup possibility, such as  $^6\text{Li}$ ,  $^7\text{Li}$ ,  $^9\text{Be}$ , will result in complex reaction processes, such as CF (complete fusion), ICF (incomplete fusion), NCBU (non-capture breakup) and transfer processes, etc. The transfer reaction includes stripping and pickup processes. From the above processes, the reactions induced by weakly bound nuclei can produce the same residues. Therefore, different processes cannot be separated by only measuring the characteristic  $\gamma$ -rays. The  $^6\text{Li} + ^{209}\text{Bi}$  experiments were performed at the Tandem-XTU accelerator of Legnaro National Laboratory of INFN in Italy. In this experiment, several gamma rays of  $^{10}\text{B}$  are observed. There are several possible reactions to form  $^{10}\text{B}$ . First of all,  $^6\text{Li}$  reacts with the  $^{209}\text{Bi}$  target,  $^6\text{Li} + ^{209}\text{Bi} \rightarrow ^{10}\text{B} + ^{205}\text{Tl}$ , which is direct a pickup reaction channel. Besides,  $^6\text{Li}$  reacts with the  $^{12}\text{C}$  foil, it also has two reaction channels, (1)  $^6\text{Li} + ^{12}\text{C} \rightarrow ^{18}\text{F} \rightarrow ^{10}\text{B} + 2\alpha$ , which is fusion-evaporation reaction, (2)  $^6\text{Li} + ^{12}\text{C} \rightarrow ^{10}\text{B} + 8\text{Be} (2\alpha)$ , which is a direct deuteron/alpha pickup reaction, one-step process. It should be noted here that  $\alpha$  pickup and deuteron pickup reaction can lead to the same products. All of the above processes can produce the  $^{10}\text{B}$  nucleus. It is difficult to give a very clear origin of  $^{10}\text{B}$  only on basis of gamma ray analysis. A coincident method of gamma rays with light charged particles can further select the reaction channels.

### Field of your work

Experiential nuclear physics

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