

Stereoscopic collisions of MeV molecular ion with atom and molecule

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Synopsis In order to clarify stereoscopic collision dynamics of MeV molecular ion in collisions with atomic and molecular target, we have developed an experimental setup combined a movable photodiode (mPD) with TOF detector. We have measured intensity and energy distributions of fragments of incident molecular ions using the mPD, which reflects dissociation patterns of incident molecule such as molecular orientations and kinetic energy releases. Using mPD signals as a start signal of TOF, we have found TOF spectra of targets coincided with fragmentation pattern of incident molecule. Stereoscopic collision dynamics of molecular ions with atoms and molecules will be reported.

Recently collision induced fragmentation processes of molecules have been paid attention in astrophysics, medical science and so on. However, it is hard to say that the fragmentation processes of molecule including neutral fragments reveal well.

We have developed an experimental setup, which combined a movable photodiode for fragments of incident molecular ion with a time-of-flight spectrometer (TOF) for ionized target, in order to clarify stereoscopic collision dynamics of MeV molecular ion in collisions with atom or molecule including neutral fragments. It is possible to detect fragment of incident molecular ion, even if fragment is neutral particle, and identify masses of the fragments from the pulse height of signals by using a conventional photodiode. Scanning the position of the photodiode, the dissociation pattern of the incident molecular ions, which reflects kinetic energy release and orientation angle of the molecule with respect to the ion beam axis, can be determined [1]. Using signals of photodiode as a start signal for the TOF, TOF spectra for ionized target coincided with dissociation pattern of incident molecular ion can be obtained.

Figure 1 shows TOF spectra for Ar targets in collisions with 1.5 MeV LiH^+ ions. Upper one corresponds TOF spectrum coincided with neutral fragment Li and lower one does that with ionized Li^+ , correspondingly. Intensities for ionized Ar are drastically different from each other, reflecting in fragmentation pattern of incident molecular ion. In the presentation, fragmentation dynamics of the target coincided with fragmentation pattern of incident molecular ion will be discussed.

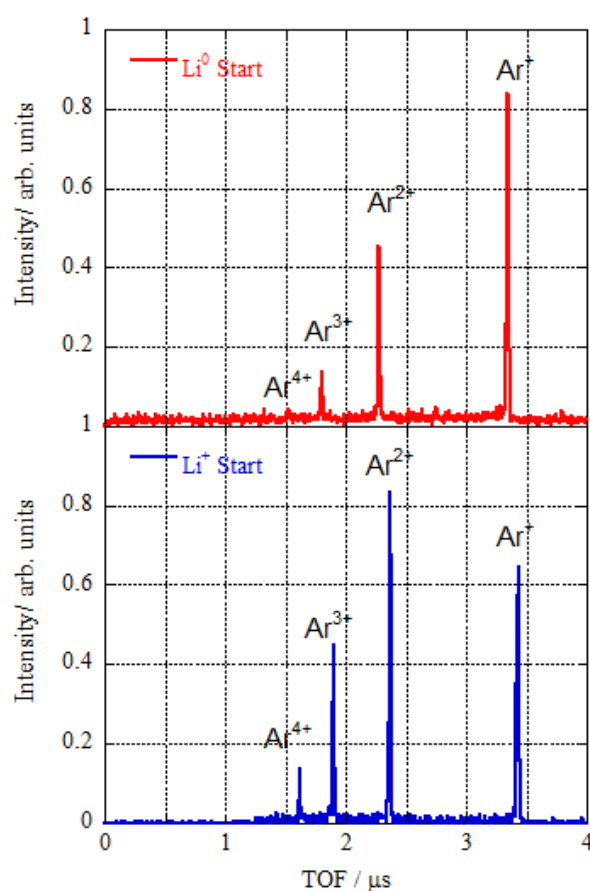


Figure 1. TOF spectra of Ar target coincided with neutral fragment Li (Upper) and ionized fragment Li^+ (Lower) in collisions of LiH^+ ions with Ar.

References

- [1] D. S. Gemmel, 1980 *Chem. Rev.* **80** 301.

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