

Isomer Effect in Positron and Electron Scattering from C₃H₆ Molecules

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Hydrocarbons play an important role in high temperature plasmas in Tokamak fusion devices in plasma processing and many other fields [1], and have thus attracted research attention especially in electron scattering. Not only is a comparative study with positron impact invaluable in revealing more information of the scattering dynamics, but the positron and positronium impact physics is increasingly offering new areas of research interests [2].

In this work, total cross sections for the two stable isomers of the C₃H₆ molecules; propene [H₃C–C=CH₂] and cyclo-propane [cyclic(H₂C–CH₂–CH₂)] are studied for the isomer effect owing to their characteristic differences in physical and chemical properties. The total cross sections (TCSs) measurements were carried out for 0.4-1000 eV electron and 0.2-1000 eV positron impact using a linear time-of-flight apparatus [3]. The Continuum Multiple Scattering (CMS) [4] calculations have also been performed for the theoretical analysis of the observed features in the TCSs. Some of the results obtained are shown in Fig. 1. Both TCSs are gradually decreasing below 2 eV, show the broad 4 – 40 eV peak split into two by a minimum at 10 eV for C₃H₆, and 13 eV for cyclo-C₃H₆, and gradually decrease above 30 eV. However, the isomer effect is clearly manifested in C₃H₆ TCSs being greater than

cyclo-C₃H₆ TCSs in the range 2.2 – 25 eV by an average 18% and vice versa in the energy range 30 – 90 eV. Detailed comparative studies with the electron results will be presented at the conference.

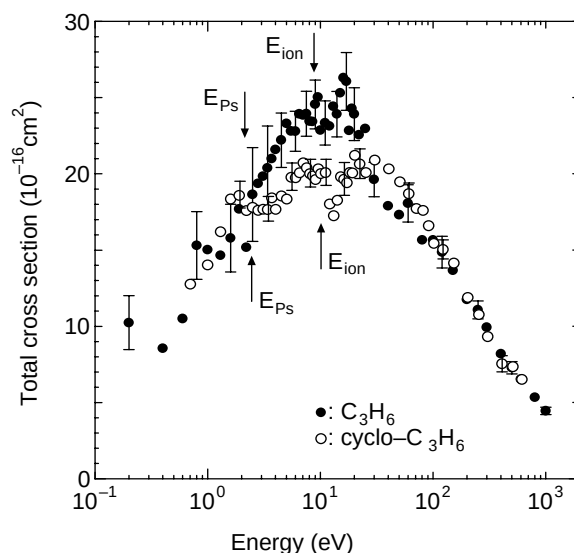


Fig. 1 C₃H₆ and cyclo-C₃H₆ positron TCSs. Arrows show the thresholds for ionization, E_{ion} , and positronium formation, E_{Ps} , i.e. pointing downwards for C₃H₆ and upwards for cyclo-C₃H₆.

References

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