Observation of indirect (e, 3e) of CO induced by electron impact

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We report an experimental investigation of ionization dissociation of CO^{2+} induced by electron impact at incident energy of 380 eV. The fragment ions (C^+/O^+) and the emitted electron were measured in coincidence by utilizing COLTRIMS technique. The kinetic-energy-release (KER) of the fragment ions and the energy of the outgoing electrons are obtained. Based on the characters of the KER distribution and the energy spectrum of the emitted electrons(see Figure 1), the direct and indirect double ionization ((e, 3e)) including an auto-ionization process were identified respectively.

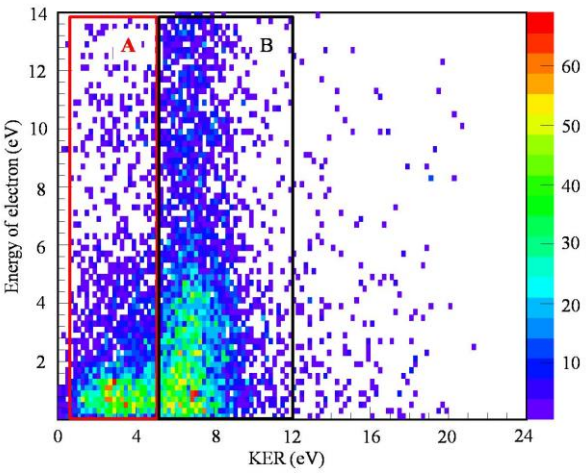

Figure 1. Two-dimensional diagram of the kinetic energy of one of the emitted electrons (vertical) versus the KER of the ionic fragments (horizontal).

Two apparent features are found as marked in Fig. 1. In the area A (marked by the red square), most of the emitted electrons distribute in the region with the electron kinetic energy less than 2 eV and the KER from 0 to 5 eV. In the area B (marked by the black square), the electrons distribute in the energy range of 0 to 14 eV and the intensity shows a monotonous decrease with the electron energy increase, and most of the electrons locate below 6 eV. The corresponding KER exhibits a broader distribution from 5 to 12 eV with a maximum around 7 eV.

For the area A, the lower KER and the concentrated energy distribution of the emitted electron reveal the indirect (e, 3e) including an auto-ionization process **[1]**. For the area B, the higher KER value and the continuous energy distribution of the outgoing electron indicate the direct (e, 3e) process.

References

[1] T. Osipov, *et al*. 2010 Phys. Rev. A **81,** 011402R.

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