Decay and Dissociation Dynamics of Core Excited Atoms, Molecules and Clusters

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Core excited molecules are highly unstable and relaxes by Auger electron emission for light elements. The stability and dissociation dynamics of the Auger final states depend on their charge states and electronic states. We have investigated them by using an Auger-electron-photoion coincidence technique.

1. Intermolecular Coulombic Decay of Core Excited Nitrogen Molecular Clusters

Intermolecular Coulombic decay is an efficient electronic relaxation of excited molecules placed in a loosely bound chemical system (such as a hydrogen bounded or van-der-Waals-bounded cluster). This decay process ionize neighboring molecules to excited one and eject low-energy electrons, which play an important role in DNA damage induced ionizing radiation. Recently, it was proposed that emission site and energy of the electron released during this process can be controlled by coupling the ICD to a resonant core excitation.[1)]

We investigated ICD process of core excited nitrogen molecular clusters by using Auger-electron ion coincidence technique.[2)] Since ICD process lower the double ionization threshold, we measured binding energy of Auger states corresponding to double ionizations. Compared to isolated nitrogen molecules, we observed lowering of double ionization threshold for nitrogen molecular clusters.

References

1) K. Gokhberg *et al.*, *Nature* **505**, 661 (2014).
2) H. Iwayama *et al.*, *J. Chem. Phys.* **145**, 034305 (2016).

Award

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