Post-collision interaction effects induced by 1s2p double ionization of Ne

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Introduction

Post-collision interaction (PCI) effects often occur in Auger cascades following inner-shell threshold ionization of atoms. The PCI effect is caused by a sudden change of the Coulomb potential that a faster Auger electron feels on overtaking an initially ejected slower photoelectron. As a result, the PCI energy distribution for the photoelectron brings about a characteristic profile; the shape is asymmetric and broadened, and its maximum is shifted in energy.

The Auger cascades result in the formation of multiply charged ions according to Auger steps of the cascades. Therefore, measurements of multiply charged ions in coincidence with threshold electrons enable one to acquire individual PCI profiles divided into the Auger steps of the cascades. Some of such PCI profiles have been measured by Hayaishi *et al*. [1-4] and Murakami *et al*. [5]. In this study, we take up PCI profiles induced by double ionization. Two threshold electrons participate in the PCI effects. It is expected that unusual effects appear in yield spectra of multiply charged ions in coincidence with threshold electrons.

Experimental method

Experiments were carried out at the undulator beamline BL-2C. Multiply charged ions in coincidence with threshold electrons were measured using a time-of-flight mass spectrometer coupled with a threshold-electron energy analyzer. The energy resolution of the analyzer was estimated to be about 0.03 eV.

Results and discussion

Figure 1 shows yield spectra of total ions and multiply charged ions in coincidence with threshold electrons near the 1s2p double ionization region of Ne. The yield spectrum of the total ions corresponds to the so-called photoabsorption spectrum, and exhibits structures due to 1s2p double excitation of Ne. The coincidence spectra of the Ne^+, Ne^{2+} and Ne^{3+} ions exhibit structures due to the double excitation and PCI profiles due to 1s2p double ionization around 908 and 912 eV. It becomes evident that the formation of the Ne^{2+} ions is dominant in decays following 1s2p double ionization of Ne.

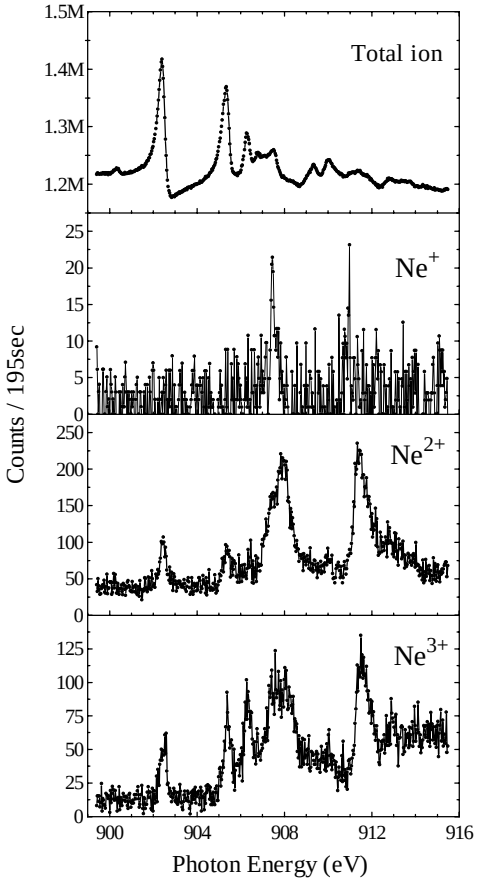

Figure 1. Yield spectra of total ions and multiply charged ions in coincidence with threshold electrons near the 1s2p double ionization region of Ne.

References

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