Electron-Impact Ionization of Se^{16+} and Se^{17+} Ions

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Electron-Impact Ionization of Se^{16+} and Se^{17+} Ions

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Synopsis Electron-impact ionization cross sections for Se^{16+} and **Se^{17+}** ions have been calculated using semirelativistic configuration-average distorted-wave (CADW) method for both the direct and indirect ionization contributions. The excitation-autoionization contributions originating from the excitations of 2s and 2p subshels were calculated using a semirelativistic level to level distorted-wave (LLDW) method. Direct ionization cross section calculations involving 2s,2p,3s, and 3p subshells were also calculated using the LANL collisional atomic code and comparisons are made.

The ionization of atoms by electron impact is one of the most fundamental electron collision processes and plays an important role in many areas of research. The modeling and diagnostic of astrophysical and laboratory plasmas need atomic data characterizing the various collision processes that might occur in them. In this study, we investigate the electron-impact ionization of Se^{16+} and Se^{17+} ions as function of incident electron energy.

The direct ionization cross sections of 2s, 2p, 3s, and 3p electrons have been calculated within the semirelativistic CADW method[1]. The excitation-autoionization contributions originating from the inner shell excitations of the type

$$2s^2 2p^6 3s^2 3p^6 \rightarrow 2s^2 2p^5 3s^2 3p^6 nl,\ 2s^1 2p^6 3s^2 3p^6 nl$$

for Se^{16+} (n=4–8, l=0–3) and

$$2s^2 2p^6 3s^2 3p^5 \rightarrow 2s^2 2p^5 3s^2 3p^5 nl,\ 2s^1 2p^6 3s^2 3p^5 nl$$

for Se^{17+} (n=3–8, l=0–3) have been calculated using both the CADW and LLDW methods[2] including autoionization branching ratios. The energies and bound orbitals needed for the calculations were obtained from the Hartree-Fock Relativistic approximations[2] including the mass velocity and Darwin corrections.

The results for Se^{16+} and Se^{17+} are shown in Figure 1a and 1b, respectively. The curves labeled as Los Alamos in these figures represent total configuration-average direct electron-impact ionization cross sections within distorted-wave approach calculated using the codes developed at the Los Alamos National Laboratory[3]. The agreement between our total direct CADW results labeled as "CADW direct" and the Los Alamos curve is quite good.

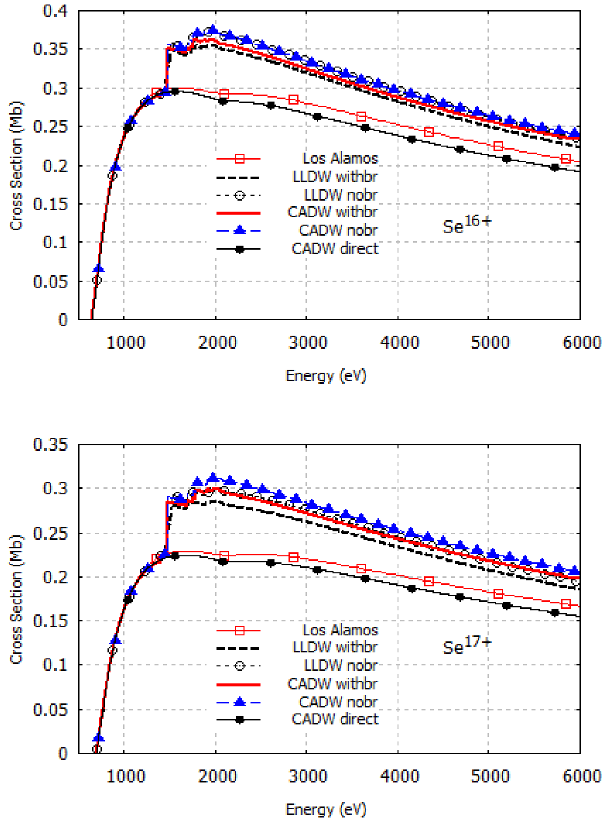

Figure 1. Electron-impact ionization cross sections for Se^{16+} and Se^{17+} The total CADW direct ionization cross sections are labeled as CADW direct in these figures. CADW direct plus LLDW and CADW excitation-autoionization contributions with and without branching ratios are represented by withbr and nobr extensions Labels "withbr" and "nobr" in the curves represent the results with and without branching ratios.

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