Electron-impact ionization cross-sections and rate coefficients for the Si-like ions Se^{20+}

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Synopsis Electron-impact ionization cross sections and rate coefficients for Si-like Se^{20+} ion are calculated using semi-relativistic configuration-average distorted-wave (CADW) method for both the direct and indirect ionization contributions. The contribution from the excitation-autoionization channels originating from the single excitations of *2s* and *2p* subshells were calculated using a semi-relativistic level to level distorted-wave (LLDW) method.

Electron-impact ionization cross-sections and rate coefficients for the Si-like ions Se^{20+}, are presented. The direct ionization cross-sections of 2s, 2p, 3s and 3p ubshells are calculated us'ng CADWmethod[1]. In addition, excitation–autoionization contributions originating from the inner-shell excitations of the type

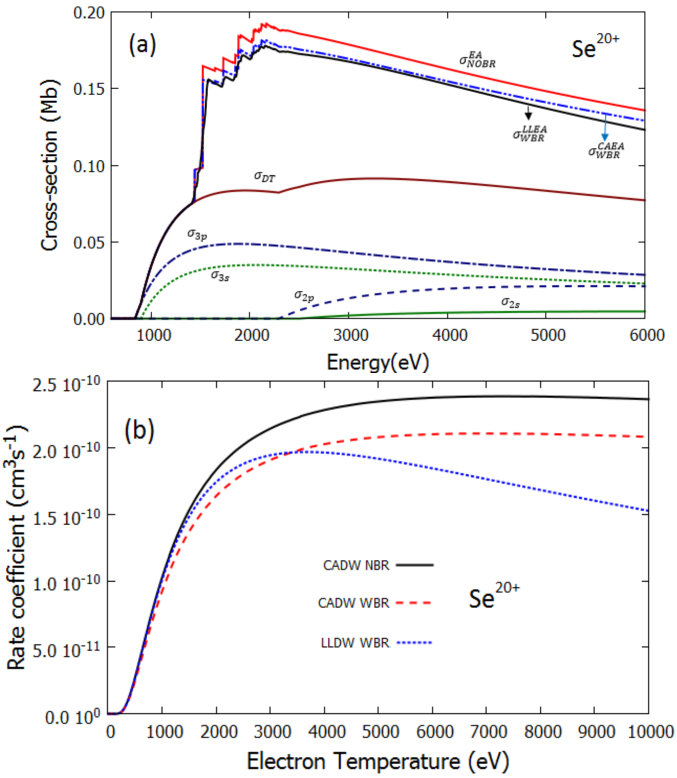
$$2s^2 2p^6 3s^2 3p^2 \rightarrow 2s^2 2p^5 3s^2 3p^2 nl$$

and

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

where $n = 3-7$ and $l = 0-4$ are calculated using both CADW and LLDW methods[1]. Branching ratios for the radiation damping of the autoionizing configurations and levels are included. Maxwellian averaged collision rates were calculated at a range of electron temperatures from cross-sections obtained in various approximations. The energies and bound orbitals needed to evaluate the cross-sections are calculated in the Hartree–Fock Relativistic (HFR) approximation [2], which includes the mass-velocity and Darwin corrections within modified Hartree–Fock differential equations. The continuum radial orbitals are obtained by solving a single-channel Schrödinger equation, which also includes the mass–velocity and Darwin corrections, where the distorting potential is constructed from HFR bound orbitals.

It is interesting to note from Figure (a) that computationally simple configuration-average distorted wave cross-section calculations (σ_{WBR}^{CAEA}) are in good agreement with the computationally demanding level-resolved calculations (σ_{WBR}^{LLEA}) for the excitation–autoionization contributions for Se^{20+} ion. WBR and NBR subscripts in Figure (a) and (b) represents the inclusion and exclusion of branching ratios from the calculations, respectively. The small disagreement between σ_{WBR}^{CAEA} and σ_{WBR}^{LLEA} are more prominent in the corresponding rate coefficients as shown in Figure (a) We hope the results in this presentation will encourage experimental measurements for such a complex case.



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