Dielectronic Recombination Rate Coefficient of Si-like ions Ni^{14+}

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Synopsis Dielectronic Recbomination (DR) rate coefficients for Si-like Ni^{14+} ion are calculated within a multi-configuration Breit-Pauli (MCBP) method using the intermediate coupling (IC) approximation with the independent processes and isolated resonance approximations.

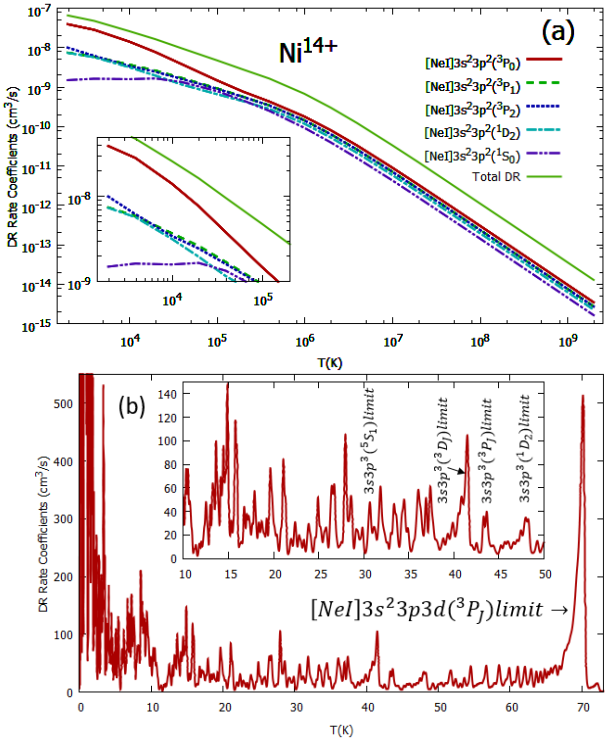
We obtained results for the DR of Si-like Ni^{14+} ion using MCBP approach within the independent processes and isolated resonance approximations. Energy levels, autoionization and radiative rates are calculated within IC using AUTOSTRUCTURE codes[1,2]. The presented results are for $\Delta n = 0$ core excitations $3s$ and $3p$ subshells during the capture of the colliding electron. The DR capture process from the ground state of Ni^{14+} described by the configurations $3s^2 3p^2, 3s3p^3, 3s^2 3p3d, 3s^2 3d^2, 3p^4$, $3s3p^2 3d, 3s3p3d^2$, $3s3d^3$, and $3p^2 3d^2$ configurations is assumed to take place through the $\Delta n = 0$ core excited bound configurations $3s^2 3p^2 nl, 3s3p^3 nl, 3s^2 3p3dnl, 3s3p^2 3dnl,$ $3s3p3d^2 nl, 3s^2 3d^2 nl, 3p^3 3dnl, 3p^4 nl, 3p^2 3d^2 nl,$ $3s3d^3 nl$ where $0 \le n \le 25$ *and* $0 \le l \le 7$ are explicitly included. Quantum defect approximation is used to include contributions from higher values on n up to 1000.

Figure (a) shows the partial rate coefficients for all levels of the ground state configuration of the Ni^{14+} and and the their sum in green curve. The partial rate coefficients are the sum of results obtained from the $\Delta n = 0$ and $\Delta n = 1$ core excitations of the type $3l \rightarrow 3l'$ and $3l \rightarrow 4l'$, respectively. For clarity at lower temperature see inset.

Figure (b) shows the spectrum consists of DR resonances at specific energies sitting on top of the monotonically decreasing continuous rate coefficient due to radiative recombination. The resonances in the energy range 0– 73 eV associated with $\Delta n = 0$ excitations are presented for the lowest ground state level.

The energy distribution of the colliding electrons in the calculations of DR resonances is assumed to be Maxwellian characterized by temperatures of $k_B T_\perp \cong 15\ meV$ and $k_B T_{||} \cong 0.15$ meV where k_B is the Boltzmann constant. The series limits are identified for different resonance series as shown in the inset of Figure (b). The strong overlapping and mixing of resonances belong to different series make it difficult to identify the individual resonances with clear labeling. Rate coefficients presented in Figure (a) are obtained by fitting the Maxwellian-averaged IC results to a formula of the type

$$\alpha = T^{-\frac{3}{2}} \sum_{i=1}^{7} c_i e^{-\frac{E_i}{T}}$$



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