§10. Dielectronic Recombination of Be-like Fe Ion

Moribayashi, K., Kato, T.

We have been studying the dielectronic recombination of the ions in order to understand the phenomena in the high temperature plasma such as tokamak and solar plasmas. In this paper, we treat the dielectronic recombination through the 2pnl and 3lnl' excited states of Fe^{22+} ion.

In dielectronic recombination, two processes, dielectronic capture process and radiative transition process exist, that is,

$$A^{+Z}+e^{-}\rightarrow A^{+Z-1**}\rightarrow A^{+Z-1*}+h\nu. \qquad (1)$$

Here A^{+Z-1**} express the autoionization state of A^{+Z-1} ion. Then dielectronic recombination rate coefficient (α) is representedby

$$\alpha=gAaAr/(\Sigma Aa+\Sigma Ar) \qquad (2)$$

where Aa and Ar represent autoionization rate and radiative transition probability. The aims of this study are (i) to estimate α for each final states and (ii) to understand the atomic nuclear dependence for Aa, Ar, and α by comparing with those for C^{2+} ion.[1]

In the case of C^{2+} ion, the α values through the $1s^2 3lnl'$states are always smaller than those through the $1s^2 2pnl$ ones[1]. On the other hand, in the Fe^{22+} ion, the α values through the $1s^2 2pnl$ states and those through the $1s^2 3lnl'$ states dominate at low and high temperature, respectively (see Fig 1). We understand the reason from atomic nuclear dependence. Finally we calculate the α values for the final excited $1s^2 2snl$ and $1s^2 2pnl$ (n=2～10) states. These values provide us the population of each excited state by a collisional radiative model. However, there are few paper which gives us enough these data as long as we know.

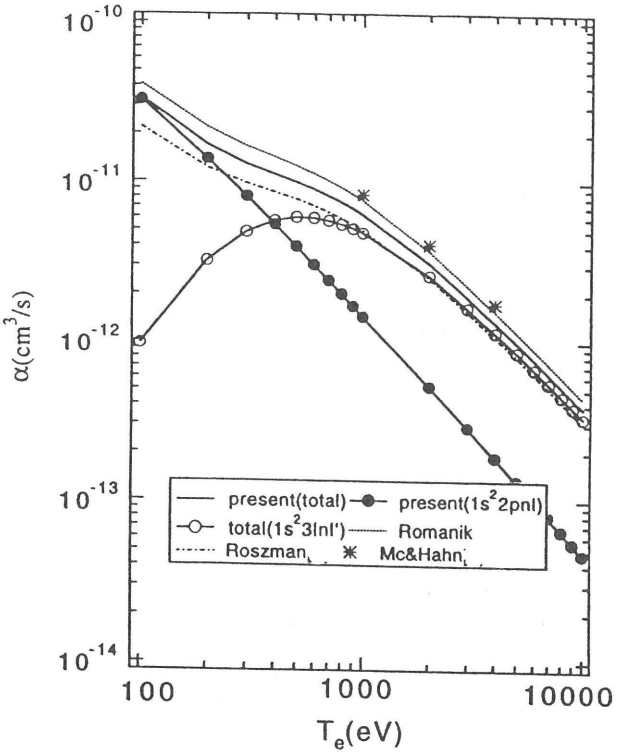

Fig. 1 α as a function of Te.

References

[1]U.I. Safronova, T.Kato, and M.Ohira, NISF-DATA-37(1996).

[2]K.Moribayashi and T.Kato, NIFS-DATA-36(1996).

[3]K.Moribayashi and T.Kato, Physica Scripta, in press.