§3. Dielectronic Recombination of Be-like Ions

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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 doubly excited states of C^{2+} ion.

In dielectronic recombination, two processes;
autoionization process:

$$C^{2+}(1s^2 2pnl) \rightarrow C^{3+}(1s^2 2s)+e \qquad (1)$$

and radiative transition process:

$$C^{2+}(1s^2 2pnl) \rightarrow C^{2+}(1s^2 2sn'l', 1s^2 2pn'l')+h\nu \qquad (2)$$

exist. Figuare 1 shows the radiative transition probability(Ar) from 2pnd doubly exitated states of C^{2+} ion. We found that 2pnl →2snl transition process dominates for large n,on the other hand,the processes from the low doubly excitated states give significant contributions to low singly excited state such as 2p2p, 2s2p, and 2s3d where the electron-correlation is strong. We also found that the probability of the 2pnl→2snl process almost keeps constant as n increases.

Figure 2 shows the autoionization probability(Aa) from 2p3d which is the same state as Figure 1. For the small value of n, Aa is much larger than Ar. However, since Aa decreases according to n^{-3}, Ar and Aa become comparable at large n around n=100.

For these n-dependences, we can extrapolate the values of Ar and Aa for large n. This is very useful because the probability at large n are needed for deriving the dielectronic recombination rate coefficients.

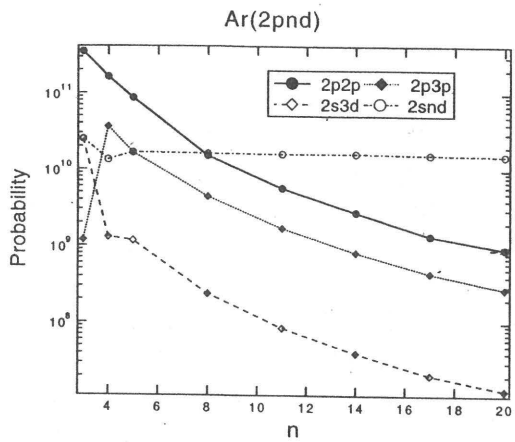

Fig.1 Radiative transition probability from 2pnd states of C^{2+} as a function of n: Solid line, dotted line, broken line, and dashed-dot line represent the process to 2p2p, 2p3p, 2s3d, and 2snd,respectively.

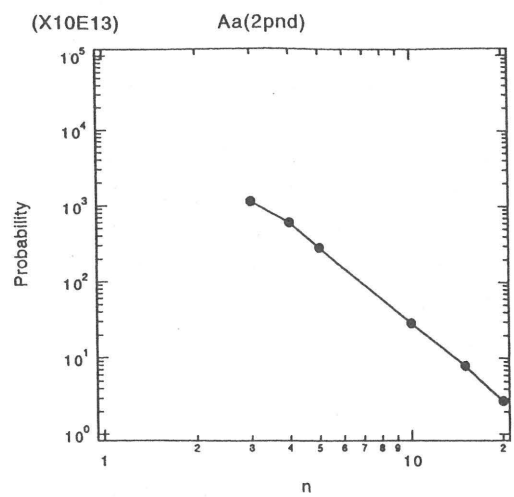

Fig.2 Autoionization probability from 2pnd state vs. n.