

§12. Effect of Recombination on Line Intensities of Be-like Ions

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We have constructed a collisional-radiative model (CRM) for Be-like ions to calculate the spectral line intensities in non equilibrium ionization plasma. In the CRM we take into account recombination processes from the ground state of a Li-like ion to the excited states of a Be-like ion as well as ionization from the excited states of the Be-like ion. We focused on Be-like Fe (Fe^{22+}) and Be-like Ne (Ne^{6+}) ions to build the CRM with their atomic data [1,2,3,4,5].

Since the dielectronic recombination process populates the electron density much more at higher excited states and cascades are important, we consider many excited states in the CRM: $2snl$ with $n \leq 70$ and $2pnl$ with $n \leq 11$ for Fe^{22+} ; and $2snl$ with $n \leq 20$ and $2pnl$ with $n \leq 6$ for Ne^{6+} . The dielectronic recombination is more important for Be-like ions than the radiative recombination or the three body recombination at high temperature and low density plasma, however, the rate coefficients are not available. So we have calculated the recombination rate coefficient with the Cowan's code, considering the dielectronic recombination through doubly excited states, $2pnl$ and $3lnl'$, to each excited state.

Using the constructed CRM, we have calculated the spectral line intensities and the radiative power losses as functions of the electron density and temperature from Fe^{22+} and Ne^{6+} ions (Figs.1 and 2). The radiative power loss is $P_{loss}(\text{ionizing})n(\text{Be-like}) + P_{loss}(\text{recombining})n(\text{Li-like})$. If the Li-like ion is more abundant than the Be-like ion or the electron temperature is low, the recombining component [$P_{loss}(\text{recombining})$] becomes important. The ionizing component [$P_{loss}(\text{ionizing})$] of Fe^{22+} ion has weak temperature dependence at around 1keV where the ion is the most abun-

dant, and the recombining component is about one tenth when the ion abundance ratio is unity.

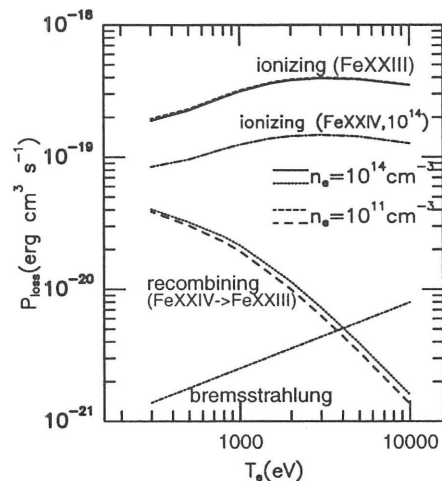


Figure 1: Radiative power loss of Be-like Fe ion as a function of an electron temperature. Ionizing plasma component and recombining plasma component are shown together with the power loss due to the bremsstrahlung and the loss of the ionizing plasma component of Li-like Fe ion.

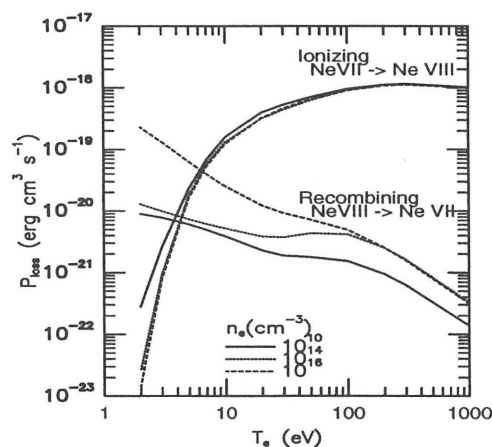


Figure 2: The radiative power loss of Be-like Ne ion as a function of an electron temperature.

References

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