# Effects of Dielectronic Recombination in Astrophysical Plasmas: Reflection Spectrum of a Black-Hole Accretion Disk

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In the context of the abundance problems in black-hole accretion disks [1], we are currently involved in a project to estimate plasma environment effects on the atomic structure and radiative parameters associated with the K-vacancy states in ions of the oxygen and iron isonuclear sequences [2–5]. These computations have been performed in the multiconfiguration Dirac–Fock framework, whereby the plasma screening is modeled with a Debye–Hückel potential. We are also interested in the plasma effects caused by the density attenuation of dielectronic recombination (DR) as recently reported by [6,7]. Their convenient analytic expressions are being incorporated in the atomic database of the XSTAR modeling code [8]. Parallelly, by eliminating the metal DR contribution in the XSTAR atomic database, we are also studying the DR manifestations in the ionization-parameter–temperature plane ($-3 \leq \text{Log}\ \xi \leq 3$; $3.5 \leq \text{Log T} \leq 7.5$) of a plasma with solar abundances. In the present report we discuss the impact of eliminating DR on the heating and cooling rates, thermal temperature, and ionization fractions, particularly at (Log $\xi$, Log T) = (1.,6.) where the higher Fe average ionic charge leads to a heating rate lower by a factor of ~2.5. The effects of eliminating DR in the reflection spectrum of a black-hole accretion disk are also discussed.

## References

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