AUGER PROCESS FOLLOWING 1S–PHOTOIONIZATION: NE III AND NE IV LINE PRODUCTION

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Removal of a 1s electron from atomic neon by highly energetic photons, gives rise mainly to the $1s2s^22p^6$ state of singly ionized neon. This state c decay mostly by ejection of an Auger electron to form various excited terms of Ne^{+2}. This process dominates largely the radiative Kα decay ($\omega_K = 0.018$). The main route to Ne^{+2} is $1s^22s^22p^4\ ^1D$ (61%) and there is no Auger decay to the ground final term (Krause et al, 1971). Shake up processes, i.e excitations of outer shells accompagning the 1s–electron ejection, produce mainly $1s2s^22p^5$ np ^2S states (n=3,4), 5% relatively to all processes (Krause, 1971). These np states radiationless decay producing numerous Ne^{+2} states. Shake off processes, i.e. ionizations of outer shells by the photoelectron, are not negligible, nearly 14% relatively to all processes (Krause, 1971) for photons with energy greater than 1 keV. Shake off process leads by radiationless transitions to three or four times ionized neon. The $1s2s2p^5$ state is strongly favoured by shake off process and decay to the main configurations of Ne^{+3} $1s^22s^m2p^n$ (Krause, 1971). In an analagous way, the case of oxygen presents the same interesting features but there is actually a lack of experimental and theoretical data (Caldwell and Krause, 1993, Petrini and Araújo, 1993).
In the study of active galactic nuclei, where high energetic photons are largely present, no interest has been devoted to these features. A thin plasma excited by a soft X–ray source (energy greater than 1 keV) will produce directly, by the double process 1s–photoionization followed by Auger decays, Ne III, Ne IV and Ne V allowed and forbidden lines. Their relative intensities will depend basically on Auger rates, transition probabilities and radiative cascades. It has to be noted that these relative intensities have a weak dependency on incident photon energies.

References

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