

Electron impact M -subshell ionization of atoms at relativistic energies

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Synopsis We propose an extension of our recently modified simplified-improved-binary-encounter dipole (MUIBED) model [1] suitable even for relativistic energies. This new model (XMUBED) is applied to calculate the electron impact single M -subshell ionization cross-sections for atomic targets with various charges Z ($79 \leq Z \leq 92$). The parameters of the MUIBED model for the M -shell ionization calculations are modified to account well for fourteen atomic targets (between Au and U) for the inner M -subshell ionization cross sections.

Electron impact ionization cross section (EIICS) of inner subshells of atoms are required for different branches of physics, such as atomic physics, plasma physics, radiation physics, material analysis and astrophysics.

While for the K -shell, L -shell (total) and M -shell (total) there are few calculations in literatures, but for L -subshell and M -subshell targets, very few calculations are available, to the best of our knowledge. Moreover, the huge demand in applications for the ionization cross sections cannot be fulfilled by generating a database either by experiment or by quantum mechanical theories. This void in data and demand can be best fulfilled by using simple-to-use model that predict reasonable accurate results for inner M -subshell ionization of atoms. In this work, we report such a model that describes experimental results with reasonable accuracy for a wide range of targets and energy with only two sub-shell dependent generalized parameters.

In Figure 1. EIICS of U atom M -shell and its subshell ($M1$, $M2$, $M3$, $M4$ and $M5$) are shown as a function of incident electron energy. A comparison with experimental data [2, 3] and quantum results [4, 5] shows very good agreement with our calculated cross sections.

Details of our results will be presented at the conference.

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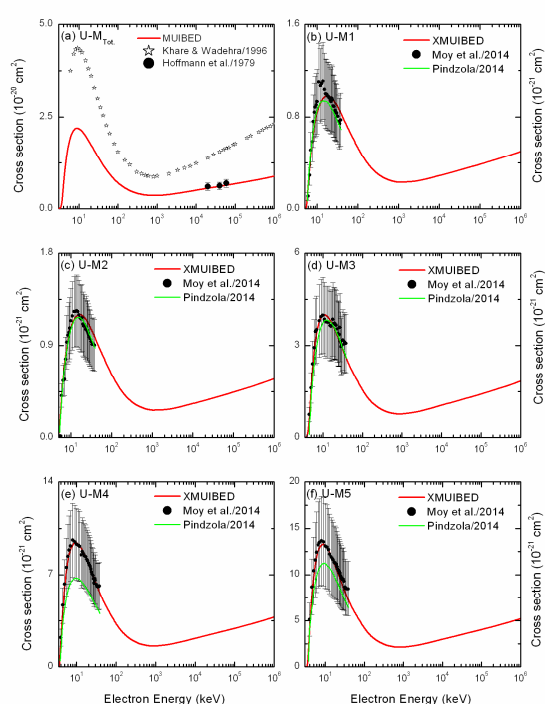


Figure 1

Figure 1. M -shell and M -subshell EIICS of U atom (a) U- M_{Tot} , (b) U- $M1$, (c) U- $M2$, (d) U- $M3$, (e) U- $M4$ and (f) U- $M5$.

References

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