Vanadium Fine-Structure K-shell Electron Impact Ionization Cross Sections for Fast-Electron Diagnostic in Laser-Solid Experiments

P. Palmeri[1], P. Quinet[1,2], and D. Batani[3]

[1]*Mécanique et Gravitation, Université de Mons – UMONS, B-7000 Mons, Belgium*
[2]*IPNAS, Université de Liège, B-4000 Liège, Belgium*
[3]*CELIA, Université de Bordeaux, F-33400 Talence, France*

Presenting Author: patrick.palmeri@umons.ac.be

The K-shell electron impact ionization (EII) cross section, along with the K-shell fluorescence yield, is one of the key atomic parameters for fast-electron diagnostic in laser-solid experiments through the K-shell emission cross section. In addition, in a campaign dedicated to the modeling of the K lines of astrophysical interest [1], the K-shell fluorescence yields for the K-vacancy fine-structure atomic levels of all the vanadium isonuclear ions have been calculated.

In this study, the K-shell EII cross sections connecting the ground and the metastable levels of the parent vanadium ions to the daughter ions K-vacancy levels considered in Ref. [1] have been determined. The relativistic distorted-wave (DW) approximation implemented in the FAC atomic code has been used for the incident electron kinetic energies up to 20 times the K-shell threshold energies. Moreover, the resulting DW cross sections have been extrapolated at higher energies using the asymptotic behavior of the modified relativistic binary encounter Bethe model (MRBEB) of Guerra *et al.* [2] with the density-effect correction proposed by Davies *et al.* [3].

References

[1] P. Palmeri *et al.* Astron. Astrophys. **543**, A44 (2012)
[2] M. Guerra *et al.* Int. J. Mass Spectrom. **313**, 1 (2012)
[3] J. R. Davies *et al.*, Phys. Plasmas **20**, 083118 (2013)