

Excitation functions of high-lying autoionizing states in Rb atoms

This content has been downloaded from IOPscience. Please scroll down to see the full text.

2014 J. Phys.: Conf. Ser. 488 042018

(<http://iopscience.iop.org/1742-6596/488/4/042018>)

View [the table of contents for this issue](#), or go to the [journal homepage](#) for more

Download details:

IP Address: 158.129.154.116

This content was downloaded on 07/10/2016 at 12:27

Please note that [terms and conditions apply](#).

You may also be interested in:

[Autoionizing states of Spatially Confined Helium Atom](#)

Jayanta K Saha

[Calculation of energies of the isoelectronic series of atoms \(\$Z = 29\$ \) using the Hartree–Fock method](#)

I N Eremkin, Yu B Malykhanov and M V Gorshunov

[Erratum: Calculation of energy straggling for fast protons \[Chin. Phys. Lett. 7 \(1990\) 184-187\]](#)

Ma Zhongquan

[Electron impact excitation of the lowest doublet and quartet core-excited autoionizing states in Rb atoms](#)

A Borovik, V Roman, O Zatsarinny et al.

[Complete Feshbach-type projection method to compute autoionizing states in Li-like atomic systems](#)

Juan Carlos Cardona, Jose Luis Sanz-Vicario and Fernando Martín

[Autoionization cross section of cesium atoms](#)

A Borovik and A Kupliauskiene

[Laser induced optical activity in the region of autoionizing states](#)

E V Gryzlova, A N Grum-Grzhimailo, A I Magunov et al.

Excitation functions of high-lying autoionizing states in Rb atoms

V.Roman*, A.Borovik*¹, A.Kupliauskienė^{†2}

* Department of Electron Processes, Institute of Electron Physics, Uzhgorod, 88017, Ukraine

† Institute of Theoretical Physics and Astronomy, Vilnius University, A.Goštauto 12, LT-01108 Vilnius, Lithuania

Synopsis The excitation dynamics and cross sections for high-lying autoionizing states in rubidium atoms were obtained by accurate measuring the ejected-electron spectra in an incident electron energy range from the excitation thresholds of levels up to 660 eV. These data together with calculations of energies and decay rates are intended for general spectroscopic classification of the $(4p^5n_1l_1n_2l_2)^{2,4}L$ states.

The excitation functions of atomic states if measured at appropriate energy resolution contain comprehensive information on processes involved in formation and decay of these states. Such data together with accurate calculations underlie the reliable spectroscopic classification of atomic states.

In the present work, we have measured the excitation functions of the lines observed in ejected-electron spectra arising from the decay of the $(4p^5n_1l_1n_2l_2)^{2,4}L$ autoionizing states in rubidium atoms. The apparatus, measuring and data processing procedures were described in our earlier works (see e.g. [1] and references therein). The data were obtained at an observation angle of 54.7° with an incident electron energy resolution of 0.2 eV. The obtained relative excitation cross section was put on an absolute scale by normalizing to the excitation cross section of the $(4p^55s^2)^2P_{3/2}$ state obtained earlier for the same impact-energy regime [1]. The total relative uncertainty of the cross section data did not exceed 35%.

Figure 1 shows the electron impact excitation functions for six lines observed in ejected-electron spectra of rubidium atoms (line numbering is taken from [2]). As can be seen, the excitation dynamics of lines definitely points out the quartet and doublet character of corresponding autoionizing states. The assignment of the latter was made by using the calculated data on energies, cross sections and decay rates of the $(4p^5n_1l_1n_2l_2)^{2,4}L$ states [3] (see Table 1).

This work was supported by the National Academy of Sciences of Ukraine (VR, AB) and by the European Social Fund under the Global Grant measure (project VP1 - 3.1 - ŠMM - 07 - K - 02 - 013) (AK).

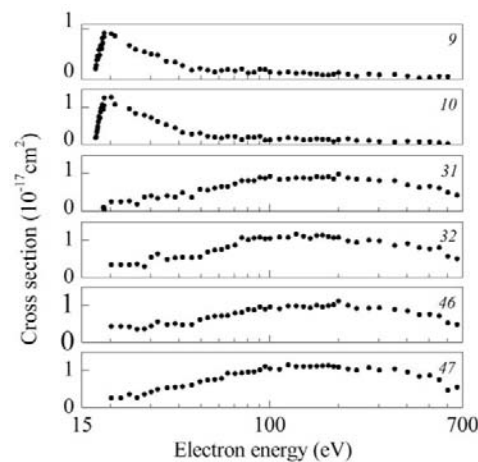


Figure 1. Excitation functions of lines observed in ejected-electron spectra of rubidium atoms.

Table 1. Assignment, excitation thresholds E_{exc} (eV) and cross sections σ_{max} (10^{-17}cm^2) for some high-lying autoionizing states in rubidium.

Line	Assignment	E_{exc}	σ_{max}
9	$(4d5s^3F)^4F_{7/2}$	17.18	0.93
10	$(4d5s^3F)^4F_{5/2}$	17.23	1.27
31	$(4d5s^1P)^2P_{1/2}$	18.82	0.98
32	$(4d5s^1P)^2P_{3/2}$	18.89	1.16
46	$(5s5d^3P)^2P_{1/2}$	19.66	1.11
47	$(5s6s^1P)^2P_{3/2}$	19.73	1.15

References

- [1] A Borovik *et al* 2013 *J. Phys. B* **46** 015203
- [2] V Pejcev *et al* 1977 *J. Phys. B* **10** 1653
- [3] A Kupliauskienė *et al* 2013 *Phys. Scr.* (to be published)

¹ E-mail: sasha@aborovik.uzhgorod.ua

² E-mail: alicija.kupliauskiene@tfai.vu.lt