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Stark broadening parameters for Cu III and Zn III spectral lines

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Abstract. Here we present Stark widths for three transitions of Cu III and three transitions of Zn III calaculated by using the modified semiempirical approach.

Key words. Line:profiles - atomic data - atomic processes - line:formation - stars: atmospheres

1. Introduction

Stark broadening of ion and atom lines is of interest in the investigation of laboratory and astrophysical plasma. With the development of space-born spectroscopy, observations of spectral lines of trace elements like copper and zinc, become available. From the analysis of 11 Hg-Mn star spectra (Jacobs & Dworetsky 1981) for example, it follows that copper is clearly overabundant in 10 of investigated stars. Zinc spectral lines are present as well in stellar spectra (Adelman 1994; Cowley 2000; Ryabchikova 2000).

The knowledge of Stark broadening parameters is also of interest for the investigation of laboratory and technological plasmas. For example, Spectral lines of Cu III and Cu IV are of particular interest for the diagnostic and modelling of plasma created in electromagnetic macro particle accelerators where in experimental work, the plasma is usually created by Cu or Al foil evaporation. Also, doubly charged zinc ion is a member of the nickel isoelectronic sequence, known to include possible candidates for development of ultraviolet lasers.

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2. Results and discussion

Here we present Stark widths for three transitions of Cu III and three transitions of Zn III

Table 1. Stark widths have been obtained by modified semiempirical theory for perturber density of 10^{17} cm^{-3}.

TRANSITION	T[K]	W(Å)
CuIII	10000	0.206E-01
	20000	0.146E-01
4s ^{4}F - 4p ^{4}F^o	50000	0.921E-02
	100000	0.651E-02
1601.6 Å	200000	0.497E-02
	300000	0.444E-02

Table 1. Continued.

TRANSITION	T[K]	W(Å)
CuIII	10000	0.220E-01
	20000	0.156E-01
4s ^{4}F - 4p ^{4}G^o	50000	0.984E-02
	100000	0.696E-02
1667.7 Å	200000	0.533E-02
	300000	0.476E-02
CuIII	10000	0.232E-01
	20000	0.164E-01
4s ^{4}F - 4p ^{4}D^o	50000	0.104E-01
	100000	0.732E-02
1716.8 Å	200000	0.562E-02
	300000	0.502E-02
ZnIII	10000	0.824E-02
	20000	0.583E-02
4s ^{1}D - 4p ^{1}D^o	50000	0.369E-02
	100000	0.261E-02
1619.6 Å	200000	0.187E-02
	300000	0.160E-02
ZnIII	10000	0.835E-02
	20000	0.590E-02
4s ^{1}D - 4p ^{1}F^o	50000	0.373E-02
	100000	0.264E-02
1639.3 Å	200000	0.189E-02
	300000	0.161E-02

calaculated by using the modified semiempirical approach (Dimitrijević & Konjević 1980).

Table 1. Continued.

TRANSITION	T[K]	W(Å)
ZnIII	10000	0.580E-02
	20000	0.410E-02
4s ^{1}D - 4p ^{1}P^o	50000	0.259E-02
	100000	0.183E-02
1562.5 Å	200000	0.130E-02
	300000	0.108E-02

Obtained theoretical results will be used to consider the influence of Stark broadening for A type star atmospheres conditions (Simić et al. 2005).

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References

Adelman, S. J. 1994, MNRAS, 271, 355.

Cowley, C. R. et al. 2000, MNRAS, 317, 299.

Dimitrijević, M. S., Konjević, N. 1980, J. Quant. Spectrosc. Radiat. Transfer, 24, 451.

Jacobs, J. M., & Dworetsky, M. M. 1981, Proc. 23d Liege Ap. Colloquium, Star Main Sequence Cp Stars, Liege, p. 153.

Ryabchikova, T. A. et al. 2000, A&A, 357, 981.

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