Table 2. Table 2 Analyses of individual atomic lines. Columns from left to right are: the names of ion, wavelength in Å, excitation potential (χ) in eV, log *gf* value, reference for log *gf*, log ϵ, and the remark (HFS : the abundances determined by adopting the HFS data taken from Kurucz (?)).

Ion	λ (Å)	χ (eV)	log *gf*	Ref.	log ϵ	remark
He I	(log ϵ(He I) $\leq$ 9.0)		upper limit			
	5875.6				$\leq$ 9.0	
	5875.60	20.96	-1.52	NI		
	5875.61	20.96	-0.34	NI		
	5875.62	20.96	0.41	NI		
	5875.63	20.96	-0.34	NI		
	5875.64	20.96	0.14	NI		
	5875.97	20.96	-0.22	NI		
C II	(log ϵ(C I) $\leq$ 8.3)		upper limit			
	4267				$\leq$ 8.3	
	4267.00	18.04	0.56	HH		
	4267.26	18.04	0.79	HH		
	4267.26	18.04	-0.59	HH		
O I	(log ϵ(O I) = 8.31)					
	6156–58				8.31	
	6155.96	10.74	-1.36	NI		
	6155.97	10.74	-1.01	NI		
	6155.99	10.74	-1.12	NI		
	6156.74	10.74	-1.49	NI		
	6156.76	10.74	-0.90	NI		
	6156.78	10.74	-0.69	NI		
	6158.15	10.74	-1.84	NI		
	6158.17	10.74	-1.00	NI		
	6158.19	10.74	-0.41	NI		

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Table 3. Table 2 continued

Ion	λ (Å)	χ (eV)	log *gf*	Ref.	log ϵ	remark
Mg I	(log ϵ(Mg I) = 7.30 ± 0.42)					
	4702.99	4.35	−0.67	KX	7.60	
	5528.40	4.35	−0.34	NI	7.00	
Mg II	(log ϵ(Mg II) = 7.15 ± 0.19)					
	4390.6				7.08	
	4390.51	10.00	−1.49	KX		
	4390.57	10.00	−0.53	KX		
	4433.99	10.00	−0.91	KX	7.30	
	4436.5				7.30	
	4436.49	11.57	−0.89	KX		
	4436.49	11.57	−2.19	KX		
	4436.59	11.57	−1.04	KX		
	4481				6.90	
	4481.13	8.86	0.73	NI		
	4481.15	8.86	−0.57	NI		
	4481.33	8.86	0.58	NI		
Si II	(log ϵ(Si II) = 7.75 ± 0.09)					
	4128.05	9.84	0.32	NI	7.65	
	4130.9				7.80	
	4130.87	9.84	−0.82	KX		
	4130.89	9.84	0.48	KX		
	5957.56	10.07	−0.35	NI	7.80	

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Table 4. Table 2 continued

Ion	λ (Å)	χ (eV)	log gf	Ref.	log ϵ	remark
Cl II	(log ϵ(Cl II) = 7.39 ± 0.17)					
	4794.56	13.38	0.40	NI	7.21	
	4810.07	13.38	0.24	NI	7.53	
	4819.48	13.38	0.02	NI	7.44	
Sc II	(log ϵ(Sc II) = 3.06)					
	4314.08	0.62	−0.10	NI	3.06	
Ti II	(log ϵ(Ti II) = 5.49 ± 0.38)					
	4301.91	1.16	−1.16	NI	5.34	
	4394.05	1.22	−1.59	NI	5.40	
	4411.93	1.22	−2.41	KX	5.75	
	4468.51	1.13	−0.62	NI	4.84	
	4470.86	1.16	−2.28	NI	5.80	
	4763.88	1.22	−2.45	KX	5.81	
V II	(log ϵ(V II) = 4.75)					
	4183.44	2.05	−1.11	BG	4.75	
Cr I	(log ϵ(Cr I) = 7.61 ± 0.45)					
	4274.80	0.00	−0.23	NI	6.97	
	4374.17	3.00	−0.49	NI	8.00	
	4730.70	3.08	−0.19	NI	7.70	
	4756.14	3.10	0.09	NI	7.78	

Table 5. Table 2 continued

Ion	λ (Å)	χ (eV)	log gf	Ref.	log ϵ	remark
Cr II	(log ϵ (Cr II) = 7.36 $\pm$ 0.48)					
	4222.00	5.66	−1.93	KX	7.30	
	4503.56	5.66	−3.30	KX	8.15	
	4577.42	8.35	−1.42	KX	7.83	
	4592.05	4.07	−1.22	NI	6.80	
	4634.09	4.07	−1.25	NI	7.16	
	4723.34	4.17	−2.71	KX	7.40	
	4779.05	5.67	−1.93	KX	7.20	
	4812.34	3.86	−1.80	NI	6.83	
	4836.23	3.86	−2.25	NI	6.85	
	4884.61	3.86	−2.08	NI	7.00	
	4896.05	6.48	−2.46	KX	7.85	
	4912.46	6.48	−0.95	KX	7.04	
	5308.41	4.07	−1.81	NI	6.88	
	5508.61	4.16	−2.12	NI	7.00	
	5678.39	6.48	−1.24	KX	7.31	
	6118.03	11.08	−0.47	KX	8.20	
	6181.35	11.14	0.19	KX	7.94	
	6418.90	6.69	−1.79	KX	7.80	
Mn II	(log ϵ(Mn II) = 6.30 $\pm$ 0.00)					
	4252.96	6.19	−1.14	KX	6.30	HFS
	4755.73	5.40	−1.24	KX	6.30	HFS
	4806.82	5.42	−1.56	KX	6.30	HFS
Fe I	(log ϵ(Fe I) = 8.32 $\pm$ 0.17)					
	4154.50	2.83	−0.69	KX	8.36	
	4219.36	3.57	0.12	NI	8.20	
	4260.47	2.40	−0.02	NI	8.13	
	4415.12	1.61	−0.61	NI	8.14	
	4484.22	3.60	−0.72	NI	8.41	
	4611.28	3.68	−0.67	KX	8.31	
	4910.33	4.19	−0.47	KX	8.58	
	4910.56	4.22	−0.44	KX	8.52	
	4983.87	4.10	−0.07	KX	8.46	
	5269.54	0.86	−1.32	NI	8.09	

Table 6. Table 2 continued

Ion	λ (Å)	χ (eV)	log gf	Ref.	log ϵ	remark
Fe II	(log ϵ(Fe II) = 8.29 $\pm$ 0.32)					
	4178.86	2.58	−2.54	RU	7.89	
	4303.17	2.70	−2.49	RU	7.78	
	4314.31	2.68	−3.60	RU	8.46	
	4318.19	7.88	−1.88	RU	8.70	
	4319.41	7.65	−1.99	RU	8.57	
	4372.22	2.68	−4.98	RU	8.75	
	4385.39	2.78	−2.58	RU	8.05	
	4416.83	2.78	−2.60	RU	8.09	
	4451.98	11.26	−0.74	KX	8.35	
	4455.27	6.23	−2.00	RU	8.83	
	4472.93	2.83	−3.53	RU	8.45	
	4480.69	6.23	−2.56	RU	8.30	
	4499.69	7.69	−1.68	RU	8.55	
	4508.28	2.86	−2.35	RU	7.77	
	4510.51	6.22	−3.05	RU	8.47	
	4520.22	2.81	−2.62	RU	7.70	
	4522.63	2.84	−2.17	RU	7.82	
	4576.34	2.84	−2.98	RU	7.99	
	4582.84	2.84	−3.22	RU	8.07	
	4583.83	2.81	−2.02	RU	7.96	
	4620.51	2.83	−3.31	RU	8.12	
	4640.81	7.71	−1.74	RU	8.59	
	4666.76	2.83	−3.37	RU	8.24	
	4923.93	2.89	−1.50	RU	7.73	
	4993.36	2.81	−3.68	RU	8.58	
	5315.56	8.23	−1.46	RU	8.68	
	5529.93	6.73	−1.81	RU	8.48	
	5871.80	10.83	0.28	RU	8.36	
	5991.38	3.15	−3.65	RU	8.51	
	6084.10	3.20	−3.88	RU	8.60	
	6147.74	3.89	−2.83	RU	8.34	
	6149.26	3.89	−2.84	RU	8.37	
	6238.39	3.89	−2.75	RU	8.32	
	6446.41	6.22	−2.08	RU	8.42	
	6516.08	2.89	−3.43	RU	8.41	

Table 7. Table 2 continued

Ion	λ (Å)	χ (eV)	log gf	Ref.	log ϵ	remark
Co I	(log ϵ(Co I) = 8.44 ± 0.10)					
	4478.31	3.10	−1.21	KX	8.50	HFS
	5341.33	4.15	0.04	KX	8.34	HFS
	5352.05	3.58	0.07	NI	8.40	HFS
	5381.77	4.24	−0.07	KX	8.40	HFS
	6006.35	4.40	−0.23	KX	8.36	HFS
	6082.43	3.51	−0.52	NI	8.45	HFS
	6595.86	3.71	−0.70	KX	8.58	HFS
Co II	(log ϵ(Co II) = 8.35 ± 0.37)					
	4309.41	7.61	−2.07	KX	8.60	
	4396.94	5.07	−2.60	KX	8.43	
	4482.66	5.12	−2.87	KX	8.67	
	4497.43	3.41	−2.54	KX	7.77	
	4506.24	3.01	−4.74	KX	8.77	
	4537.93	5.12	−2.22	KX	8.01	
	4559.83	3.49	−3.56	KX	7.70	
	4586.83	3.46	−3.85	KX	8.00	
	4915.42	3.41	−3.43	KX	8.50	
	6373.80	11.84	0.68	KX	8.60	
	6522.09	12.01	0.78	KX	8.60	
	6538.71	11.90	0.97	KX	8.55	
Ni II	(log ϵ(Ni II) = 6.90)					
	6124.89	6.39	−2.05	KX	6.90	
Sr II	(log ϵ(Sr II) = 2.96 ± 0.16)					
	4077.71	0.00	0.15	NI	2.85	
	4215.52	0.00	−0.17	NI	3.07	
Y II	(log ϵ(Y II) = 4.33 ± 0.37)					
	4982.13	1.03	−1.30	NI	4.55	
	5200.42	0.99	−0.58	NI	4.10	
	5662.93	1.94	0.16	KX	3.93	
	5728.89	1.84	−1.13	NI	4.73	

Table 8. Table 2 continued

Ion	λ (Å)	χ (eV)	log *gf*	Ref.	log ϵ	remark
Ba II	(log ϵ(Ba II) ≤ 2.1)	upper limit				
	4554.03	0.00	0.16	NI	≤ 2.1	
La II		(log ϵ(La II) = 4.00)				
	6262.29	0.40	−1.22	LB	4.00	
Ce II		(log ϵ(Ce II) = 4.68 ± 0.21)				
	4123.87	0.86	0.28	B	4.40	
	4185.33	0.98	−0.56	B	4.73	
	4310.70	0.50	−0.95	B	4.90	
	4390.27	1.46	0.17	B	4.70	
Pr II		(log ϵ(Pr II) = 4.70)				
	5815				4.70	
	5815.17	1.05	−0.26	KX		
	5815.33	1.58	0.27	KX		
Pr III		(log ϵ(Pr III) = 4.68 ± 0.27)				
	4910.82	0.17	−1.77	B	4.60	
	4929.12	0.36	−1.88	B	4.63	
	5284.69	0.17	−0.59	B	4.30	
	5299.99	0.36	−0.53	B	4.50	
	5765.24	1.55	−1.10	B	4.62	
	5998.93	0.17	−1.80	B	4.95	
	6053.00	0.00	−1.84	B	5.10	
	6090.01	0.36	−0.82	B	4.46	
	6160.23	0.17	−0.98	B	4.55	
	6361.65	0.17	−2.08	B	5.05	
Nd III		(log ϵ(Nd III) =4.74 ± 0.13)				
	5102.42	0.63	−0.38	B	4.65	
	5294.10	0.00	−0.65	B	4.68	
	5633.54	0.14	−2.06	B	4.88	

Table 9. Table 2 continued

Ion	λ (Å)	χ (eV)	log gf	Ref.	log ϵ	remark
Eu II	(log ϵ(Eu II) = 4.14 $\pm$ 0.38)					
	6303.42	1.28	-0.84	LW	4.35	HFS
	6645.06	1.38	0.20	LW	3.76	HFS
Eu III	(log ϵ(Eu III) = 5.30 $\pm$ 0.42)					
	4838.00	3.55	-2.49	MR	5.60	
	6666.35	3.98	-0.98	MR	5.00	
Gd II	(log ϵ(Gd II) = 4.53 $\pm$ 0.28)					
	4162.73	0.49	-0.72	KX	4.60	
	4163.09	0.66	-0.84	KX	4.40	
	4229.80	1.62	-0.02	KX	4.15	
	4597.91	0.60	-0.99	KX	4.60	
	4894.30	1.17	-1.08	KX	4.90	
Dy II	(log ϵ(Dy II) = 4.75)					
	4689.75	1.85	-0.71	KX	4.75	
Dy III	(log ϵ(Dy III) = 4.07)					
	4434.27	0.52	-1.13	B	4.07	

Reference for log gf values
B : Biémont et al. (?)
BG : Biémont et al. (?)
HH : Hirata & Horaguchi (?)
KX : Kurucz (?)
LB : Lawler et al. (?)
LW : Lawler et al. (?)
MR: Mashonkina et al. (?)
NI : NIST (?)
RU : Raasen & Ulings (?)