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Chemical abundances study of three Am stars HD 155375, HD 159560 and HD 196544

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Abstract. A synthetic spectrum analysis of CCD observations in the spectral region $\lambda\lambda$ 6400–6500 ÅÅ of the stars HD 155375, HD 159560, and HD 196544 was carried out. All stars show typical Am characteristics.

Key words: stars: chemically peculiar – stars: binaries – stars: abundances

1. Introduction

It is generally accepted that the Am peculiarity is enabled by the slow rotation of Am stars, which allows microscopic particle diffusion. Slow rotation is caused by the tidal effects in binary systems. Most recently, Fossati *et al.* (2007, and references therein) found good agreement between their observations and theoretical models. Nevertheless, there is evidence that the Am and Ap phenomena are more complicated; their peculiarity depends on orbital elements, and the role of a stellar companion is more than just to slow down the rotation of a "single" star (Budaj, Iliev 2003, and references therein).

2. Observations, spectrum synthesis, and results

CCD spectroscopic observations were carried out at the 2-m RCC telescope of the BNAO Rozhen to provide spectra in a 100 Åwide spectral region centered at 6439 Å with a resolving power $R \sim 30\,000$. The typical S/N ratio is 300. Standard IRAF procedures were used for all the data reduction. Telluric lines were removed using spectra of hot, fast rotating stars.

The atmospheric parameters were derived from both $uvby\beta$ and Geneva photometry. The atmospheric parameters $T_{\rm eff}$ and $\log g$ accepted by us are given in Table 1. A detailed spectrum synthesis of the spectral region was carried out using the code SYNSPEC (Hubeny *et al.*, 1994). Model atmospheres were interpolated from Kurucz (1993). The VALD atomic line database was used to create a line list for the spectrum synthesis. The computed spectra were convolved with the instrumental profile and rotationally broadened to fit the observations.

Table 1. Abundances derived in terms of [N/H]. Abundances for the Sun are in $\log A + 12.0$ scale. The atmospheric parameters are also shown.

element	Sun	HD 155375	HD 159560	HD 196544
C	8.52	−0.22	−0.57	−0.34
N	7.92	+0.08	+0.06	+0.08
O	8.83	−0.26	−0.15	−0.29
Si	7.55	+0.15	+0.02	+0.10
S	7.33	–	+0.27	+0.15
Ca	6.36	−0.65	−0.73	−0.48
Ti	5.02	+0.09	−0.17	+0.19
Fe	7.50	+0.26	+0.31	+0.27
Ba	2.21	+1.83	+1.62	+1.19
$\xi_{\rm turb}$ (km s^{-1})		2.1	2.7	2.4
$v \sin i$ (km s^{-1})		31	42	43
$T_{\rm eff}$ (K)		8610	7440	9090
$\log g$		4.02	4.11	4.33

HD 155375 (HR 3685, A1m) is a spectroscopic binary star with an orbital period of $23^{\rm d}.25$. The eccentricity of the orbit is $e = 0.43$. This is a typical Am star: Ca is underabundant and Fe is overabundant. The light elements C and O are underabundant, while N is almost solar. The lines of Ba are very strong, and the overbundance of Ba is remarkable.

HD 159560 (HR 6555, A4m) is a spectroscopic binary star. The angular separation between the components is $61''.9$, the orbital period is $38^{\rm d}.13$, and the eccentricity is 0.04. This star also shows strong underabundances of C and Ca and typical overabundance of Fe. The lines of Ti are weak.

HD 196544 (5 Del, HR 7883) is a A2 V spectroscopic binary star. The orbital period is $11^{\rm d}.04$, and the eccentricity is $e = 0.23$. Results of the synthetic procedure for HD 196544 show underabundances of the light elements like C, N, O, and Ca and overabundances of the iron-peak elements Fe, Ti, Cr. The lines of Ba are also very strong.

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