

NEAR INFRARED SPECTRA OF 103 BRIGHT Be STARS

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OBSERVATIONS.

We have observed 103 bright Be stars in the near infrared up to 10500 Å with a dispersion of 230 and 50 Å mm⁻¹. The observations were performed with a Reticon (1024 diodes) attached to the ROUCAS spectrograph at the 193 cm telescope of the Haute Provence Observatory.

In this spectral range, the Be stars are characterized by the lines of HI (Paschen series), OI(7772-74-75, 8446 Å), CaII(8542, 8662, 8498 Å), FeII (7712, 9997 Å) and NI(8686-83-80, 8719-12-03, 8629 Å).

On our spectra, the CaII triplet is always blended with P13, P15, P16, and only the enhancement of these lines permits to conclude to the CaII presence. The OI 8446 Å is perturbed by the Paschen lines P17 and P18 (low dispersion spectra) and P18 (high dispersion spectra). The NI 8686-83-80 Å lines also perturb the P13 profile.

RESULTS DISCUSSION.

Hydrogen lines.

Among the 93 observed stars (shell stars are excluded), 41 % exhibit Paschen lines in emission, mainly in the earlier spectral types (78 % in B0.5-B2 : 50 % in B2.5-B3 : 25 % in B4-B5 : no star in later types).

Following the P12 profiles characteristics (spectra at 50 Å mm⁻¹), we distinguish :

- The stars (P12a) where P12 is a pure absorption (fig. 1).
- The stars (P12ew) where P12 is a faint emission, situated below the continuum, at the center of a broad photospheric absorption (fig. 2).
- The stars (P12es) where P12 is a pure emission (fig. 3) or a strong emission, situated above the continuum, at the center of a broad photospheric absorption.

The emissivity of the Paschen lines is very strong (Andrillat, Houziaux, 1967) and one often observes the high terms until P20...P23 (fig. 2 and 3), while there is no trace of emission in the analogous lines of the Balmer series (lines which have the same upper level) : the emissivity is visible until H_γ, H_δ and sometimes H_ε, H_g. Mainly in the (P12ew) stars, the Paschen emission lines are superposed to a large photospheric absorption visible until P15 (fig. 2).

Among the observed stars, 59 % exhibit Paschen lines in absorption (up to P16 in the earlier types and P19 in the later ones), while the Balmer lines present an emissivity at H_α, H_β and sometimes H_γ.

Oxygen lines.

The OI 8446 Å line has a greater tendency to go into emission

(59 % of our sample) than OI 7774 Å (39 %). This effect is explained by a fluorescence mechanism due to the fortuitous coincidence of the levels of L_{β} (1025.717 Å) and OI (1025.766 Å). The predicted correlation between the intensity of H_{α} and of OI 8446 Å was observed by Kitchin and Meadows (1970) for 22 Be stars. We observe a good correlation, quasi linear (fig. 4), between the equivalent widths of OI 8446 Å and of H_{α} . This result confirms the probability of the Bowen fluorescence mechanism in the OI 8446 Å line formation.

Calcium lines.

We observe in emission the infrared calcium triplet in 25 % of stars. We found no correlation between the presence or the equivalent widths of these lines and any other characteristics of the star (spectral type, rotation, intensities of the HI, OI lines), in good agreement with the results of Polidan and Peters (1970). In the stars considered here, the triplet emission is not accompanied by appreciable emission in H and K lines which arise from a transition having the same upper level. Moreover, the intensities of the observed lines 8498, 8542 and 8662 Å are in disagreement with the predicted value (respectively 1, 9, 5).

REFERENCE LIST.

- Andrillat, Y. & Houziaux, L. (1967). Spectres IR de quelques étoiles des premiers types entre 6500 et 8800 Å. *J. Obs.*, **50**, 107.
 Kitchin, C.R. & Meadows, A.J. (1970). The behaviour of the IR lines of OI lines. *Astrophys. Space Sci.*, **8**, 463.
 Polidan, R.S. & Peters, G.J. (1976). Spectroscopic obs. of Be stars in the near IR. *IAU Symp. n° 70*. Ed. A. Slettebak, 59.

Fig. 1 HD 205551 B8IIIe (P12a)

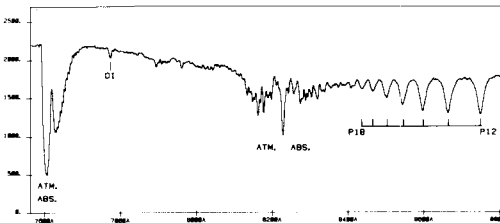


Fig. 2 HD 109387 B5IIIe (P12ew)

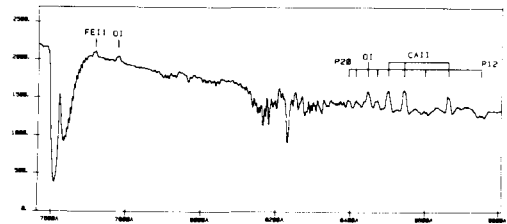


Fig. 3 HD 148184 B1.5e (P12es)

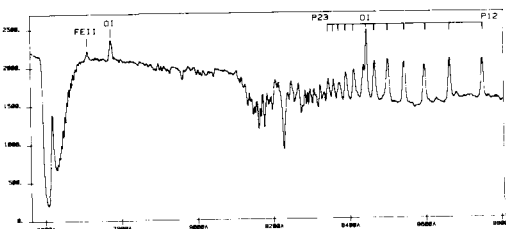


Fig. 4 OI 8446 Å as a function of H_{α}

