COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2834

Konkoly Observatory
Budapest
13 December 1985
HU ISSN 0374 - 0676

PHOTOMETRY AND SPECTROPHOTOMETRY OF SYMBIOTIC STARS : CI Cyg, Z And, V 1016 Cyg, HM Sge, HBV 475

Plates of the above mentioned symbiotic stars which were taken in July and October 1982 at the Observatoire de Haute Provence, were spectrophotometrically reduced. The S20 Image tube RCA was used in conjunction with the spectrograph. The II aO plates which were taken with a grating spectrograph covered the region λ 3700 - 5200 Å. The reciprocal dispersion was 93 Å mm^{-1} at Hγ. The II aO calibration plates were taken on the same nights as those of the symbiotic stars. The symbiotic stars' spectra were recorded using the Chalonge Microphotometer at the Lyon Observatory. The latter converted the plate transmission to intensities using the characteristic curves. The width of the Microphotometer slit was set at 25 µm.

The position of the continuous spectrum is not well defined for symbiotic stars on account of the presence of absorption bands (TiO) and emission lines.

The continuum energy distribution has been compared to the standard star δ Cyg in the blue spectral range, but the measurements do not fit well; neither do they agree with the nature of the M star.

Relative intensities of emission lines were measured on the spectrograms. The spectrophotometric corrections were made by using an intensity trace spectrum of δ Cyg taken on the same night.

Table I

		V	B-V	U-B
CI Cyg	22.7.82	10.51 ± 0.04	+ 1.20	- 0.26
	15.10.82	11.24 ± 0.01	+ 1.95	- 0.52
V1016 Cyg	27.7.82	11.23 ± 0.01	- 0.03	- 0.86
HM Sge	26.7.82	11.45 ± 0.02	+ 0.13	- 0.40
Z And	23.7.82	10.54 ± 0.01	+ 1.37	- 0.39
HBV 475	21.10.82	11.12 ± 0.04	+ 2.34	- 0.91

The photometric observations of these stars were carried out with the Polarimeter II described by Chevreton et al. (1977). The magnitudes and colour indices are given in Table I and photoelectric observations are plotted on a two-colour diagram (Figure 1).

HBV 475 : the line of HeII λ 4686 Å is very strong whereas λ 3760 Å of [FeVII] is absent λ 5007 Å > λ 4363 Å ; HeI triplets < singlets HI lines are conspicuous up to HII.

Z And : Most emission lines of FeII and HeI (singlets + triplets) appear. HI lines are strong. HeII λ 4686 Å < Hβ and [OIII] lines are absent.

V 1016 Cyg : the strong emission lines are always present. The strongest lines are those of HI, HeI, HeII, [OIII], [NeIII], [FeVII] and [FeVI] .

HM Sge : strong emission lines corresponding to V 1016 Cyg. We note that the [FeVII] and FeII lines were absent on 27th October .

CI Cyg : the forbidden lines of [NeIII] λ 3868 Å , [FeVII] λ 3760 Å , [OIII] λ 4363 Å , N1 and N2 and HeII λ 4686 Å are not affected by eclipse effects. (B-V) varied from +1.20 (out of the eclipse) to 1.88 (middle of the eclipse) while (U-B) varied from -0.26 to 0.11 (Martel, 1982).

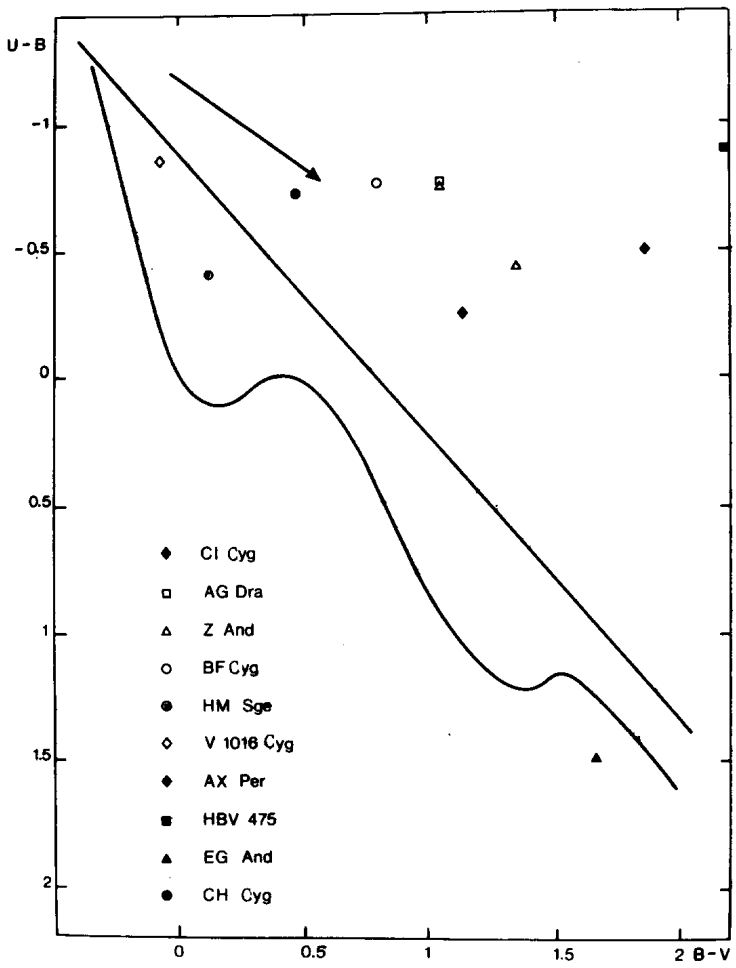
U-B
-1
-0.5
0
0.5
1
1.5
2
0
0.5
1
1.5
2 B-V
CI Cyg
AG Dra
Z And
BF Cyg
HM Sge
V 1016 Cyg
AX Per
HBV 475
EG And
CH Cyg

Figure 1

The spectra have been de-reddened by Mikolajewska et al. (1983). We have taken E(B-V) = 0.45 in agreement with measurements derived from low resolution I.U.E. spectra E(B-V) = 0.40).
The M star varied from M5V on 22.7.82 to M6III on 15.10.82 TiO bands (1-O, 2-O, O-O) are weak.
Treating the sources as blackbody radiators, we obtain approximate temperatures as follow : 4550°K for CI Cyg, 11000°K for V1016 Cyg and 13500°K for HBV 475; all three observed on the night of 15.7.82 .
The ionized gas cloud (with an electron density $n_e \sim 10^7$ cm^{-3}) suggests a temperature somewhere in the range 12000°K < Te < 20000°K for CI Cyg, HM Sge, V 1016 Cyg and HBV 475.

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