He ABUNDANCE IN RED GIANTS

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Abstract. The He abundance in red giants is not well known. Moreover, some He enhancement in the stellar atmospheres is expected to occur as a consequence of distinct dredge-up episodes. In the present work is reported and discussed the He abundance for 5 symbiotic nebulae (Hen 2-38, RR Tel, RX Pup, HM Sge, KX TrA). Self-absorption effects in both hydrogen and HeI lines were taken into account.

Key words: Symbiotic stars - Chemical abundances

1. Introduction

The analysis of the helium emission lines in symbiotic stars, which are believed to be wide binary systems including a hot ionizing source, allow an estimate of that element in red giants.

The observational data were obtained at the National Laboratory for Astrophysics (Brazopolis - Brazil) and will be discussed elsewhere (de Freitas Pacheco and Costa 1991a).

2. Method of Analysis and Results

The determination of the helium abundance in symbiotics is quite problematic. First, because hydrogen Balmer line ratios often suggest self-absorption effects. They were taken into account following the scheme by Netzer (1975), which allows determination both the optical depth at $H\alpha$ and the colour excess $E(B-V)$.

The emissivity of each HeI line was estimated according to the results of Almog and Netzer (1989). The He^{+2} concentration was derived from the intensity ratio $HeII\lambda 4686$ with respect to $H\gamma$.

The present values for the helium abundance in red giants, which are components of symbiotic systems, are comparable to those observed in planetary nebulae.

RR Tel, RX Pup and V1016 Cyg have an average ratio $\frac{(C+N)}{O} = 0.64$, which compares quite well with the solar value. The average helium abundance for these stars is $\frac{He}{O} = 0.093$. These systems have probably undergone only the first dredge-up. On the other hand, HM Sge, KX TrA and HBV 475 have higher carbon abundance and, on the average, $\frac{(C+N)}{O} = 1.05$. The average helium abundance is also higher in these systems, namely $\frac{He}{H} = 0.11$. These characteristics suggest that these last three objects are more evolved, being probably AGB stars contaminated by He-burning products.

References

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