

# Quantitative Spectral Classification of Late WC Stars

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We present a revised classification scheme for late WC-type stars based on new high quality optical observations of seven stars. For consistency with the usual WC scheme (Smith, ApJ 358 229 1990), our principal diagnostic is C IV  $\lambda 5801$ /C III  $\lambda 5696$ , while C III  $\lambda 5696$ /C II  $\lambda 4267$ , and He II  $\lambda 4686$ /He I  $\lambda 5876$  serve as secondary criteria. Our quantitative scheme forms a natural extension to the existing WC scheme and provides an unambiguous definition of subtypes, with natural breaks found between subclasses.

In Fig. 1 our primary criterion is displayed on the abscissa, with secondary criteria displayed on the ordinate axes. From this, WC9 Pop I (filled symbols) and PN central stars (open symbols) are tightly grouped, as are lower excitation stars, such as CPD-56° 8032, He 2-113, M4-18, and IRAS 17514-1555 which are classified as [WC10]. K2-16, with still lower excitation, namely absent He II and C IV emission, naturally follows as a [WC11] star, although its C III  $\lambda 5696$ /C II  $\lambda 4267$  ratio is comparable with [WC10] stars. We find that the strength and width of C III  $\lambda 5696$  provides an additional confirmation of WCL spectral classifications. SwSt1 (HD 167362), showing subtle though important stellar peculiarities, is classified as [WC10pec] owing to its contradictory line ratios based on our various diagnostics. We disagree with previous Of-WR(C) classifications (Mendez et al., A&A 252 265 1991) since photospheric O star features are absent. Our scheme is consistent with a (unique) [WC12] classification for V348 Sgr.

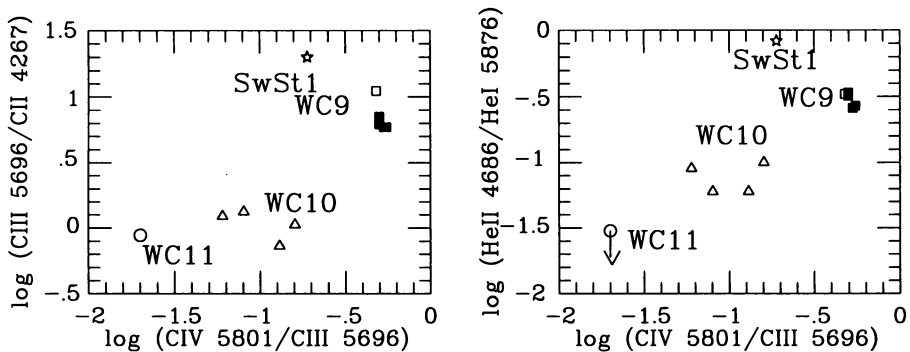


Figure 1: Primary (abscissa) and secondary classification criteria (ordinate) for WCL (filled) and [WCL] (open) stars, demonstrating the unambiguous definition of subtypes with the exception of SwSt1