PLANETARY NEBULAE WITH WR NUCLEI IN THE LMC

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Spectrophotometric studies of the LMC planetary nebulae N110, N133, N203 and LM1-64, which are known to have a WR nucleus, are presented. The spectral classification of WC for all the central stars is confirmed. Preliminary results for the physical conditions and the chemical composition derived for the nebulae are tabulated in Table 1. One important conclusion is that all the known PNe with WC nuclei in the LMC are extremely C-rich, with C/O ratios in the range from 1.6 to 5.0. A comparison of these objects with the special case of LMC PN N66, which developed a strong wind and became a WN4.5 star in the last few years (Peña et al. 1995, ApJ 441, 343) shows that the WR event in N66 is of a completely different nature. Presently the central star of N66 is several times brighter than the WC nuclei and it shows remarkable changes in the continuum emission as well as in the stellar lines, in a time scale of a few weeks. A complete version of this paper is in preparation.

Table 1. Physical Conditions and Chemical Composition of the LMC WR-PNe

	N110	N133	N203	LM1-64
T_e(NII)	12500	20000	11100	12300
T_e(OIII)	11000	11200	10000	13000
N_e(SII)	6900	3700	3900	5580
log He	11.07	11.05	11.06	11.08
log O	8.58	8.34	8.53	8.48
log N	8.06	7.84	7.64	7.93
log C	8.80	8.74	9.24	9.12
log Ne	7.85	7.44	7.66	8.13

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OPTICAL OBSERVATIONS OF V2116 OPH/GX1+4 [1]

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Optical monitoring of V2116 Oph, the optical counterpart of the Galactic Center X-ray pulsar GX1+4 has been carried out since 1991 with the R filter and a CCD camera attached to the 0.6-m and 1.6-m telescopes of Laboratório Nacional de Astrofísica (LNA/CNPq) in southern Brazil. The objective of this research is to investigate the nature of the system via the observed fast optical variability and secular variations that may trace the unknown orbital period of the binary system.

V2116 Oph is a peculiar M6III giant with $V < 19$ in a symbiotic system. The optical spectra shows high variability in Hα emission, high-excitation lines and molecular bands, typical of cool stars (Sharma et al. 1993).

Our photometric data reduction was carried out with the CHFOT package of the IRAF software. We made a power spectrun analysis with the CLEAN algorithm and used the PDM/IRAF package. The time analysis shows two significant periods: a long period of $\sim$ 308 days and a period of $\sim$ 37 days. The periods detected, the flickering in the light curve and the spectral characteristics of V2116 Oph suggest this star to be a semi-regular variable (Cristian et al. 1995) and also the presence of an accretion disk. The hightest states observed in 93, 94 and 95 could be associated with X-ray flares such as the flares observed in Hα by Greenhill et al. (1995).

The observations will be continued in 1996 using short integration times ($\sim$ 10 s) for a better observation of the flickering behavior. Confirmation of the detected periods will be attempted and the search for the system's orbital period will continue.

Greenhill, J.G. et al. 1995, MNRAS 274, L59
Cristian, V.C. et al. 1995, PASP 107, 411
Sharma, D.P. et al. 1993, Adv. Space. Res. 13 (12), 375

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