

M4–18: THE LOW EXCITATION PN AROUND A WC11 STAR

R.SURENDIRANATH and N.KAMESWARA RAO

Indian Institute of Astrophysics, Bangalore 560034, India

A photoionization model is presented for M4–18. The model includes the presence of dust mixed with gas. The model shows sulphur and nitrogen are under-abundant (relative to solar) and partially succeeds in explaining the observed IR excess.

M 4–18 has been known to be a low excitation nebula of type WC11 (van der Hucht et al. 1981, Goodrich & Dahari 1985). All the nebulae of this WC11 group show spectra dominated by numerous stellar C II and C III lines. A large IR excess is typical of these objects. We have developed a model code (Surendiranath 1992) appropriate for a low excitation nebula having gas and dust mixed together. Combining our new CCD spectra taken at Kavalur, with published observations from UV to radio wavelengths, a photoionization model was made for M 4–18. Abundances of all elements except sulphur and nitrogen are found to be normal (relative to solar). The mean T_e and N_e are 7150 K and 6400 cm^{-3} as per the model. The assumed presence of amorphous carbon grains having a power law distribution of sizes in the range of $0.04 \leq a \leq 0.55 \mu\text{m}$, explains the 12 and $25 \mu\text{m}$ IRAS bandfluxes well while failing in the 60 and $100 \mu\text{m}$ bands as well as in the range 1 to $10 \mu\text{m}$. The model requires a hotter central star and this is interpreted in terms of a “born again AGB star” that has ejected a nebula for a second time.

References

- Goodrich, R.W., and Dahari, O. (1985) *Astrophys. J.* **289**, 342.
Surendiranath, R. (1992) Ph.D. Thesis, Bangalore University.
van der Hucht et al. (1981) *Space Sci. Rev.* **28**, 227.