

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

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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 μm IRAS bandfluxes well while failing in the 60 and 100 μm bands as well as in the range 1 to 10 μm . 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

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