A STUDY OF THE PLANETARY NEBULAE ABELL 30 AND ABELL 78

M. Cohen*, H.S. Hudson**, S.L. O'Dell**, W.A. Stein***
*University of California, Berkeley
**University of California, San Diego
***University of Minnesota

We have studied the central regions of the planetary nebulae A 30 and A 78 by UBVRI photometry, optical spectroscopy, and near-infrared photometry. The spectra contain high-excitation emission lines and strongly resemble those of Wolt-Rayet stars of the carbon sequence. We infer stellar temperatures > 50,000°K. The observed 3.5-μm flux of each nebula exceeds reasonable extrapolations of both the stellar flux and any possible free-free emission. The colour temperature of this excess between 2.28 and 3.5 μm is ∿ 1000°K. For each nebula, the aperture dependence of the excess emission suggests an extended (∿ 10 arcsec radius) region centred on the nucleus. Thermal radiation from a distribution of dust that is concentrated near the nuclei seems the most plausible explanation for the excess, but no theory of dust formation or heating seems totally adequate at present. (Paper will appear in the Monthly Notices of the Royal Astronomical Society.)

DISCUSSION

Mathis: Is it not possible to suppose that the grains are being blown off the surfaces of neutral condensations by the stellar wind?

Cohen: It is quite possible to appeal to condensations in which grains might be forming. At several locations within Abell 30 and Abell 78, the nebular spectra do show emission lines of OI suggestive of neutral condensations.

Panagia: For explaining the observations of both A 30 and A 78, you find it necessary to adopt a range of grain temperatures with T_{max}/T_{min} ∿6. For NGC 7027 a similar range of temperatures is needed (from ∿90°K to ∿600°K) and the only explanation is that there is a wide range of grain sizes. I would suggest that such a size range may be a general feature of planetary nebulae.

https://doi.org/10.1017/S0074180900143384 Published online by Cambridge University Press