



Abundances in planetary nebulae: NGC1535, NGC6629, He2-108, and Tc1

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The aim of the paper is to determine abundances in a group of PNe with uniform morphology. The PNe discussed are circular excited by rather low-temperature central stars. The relation between abundance and evolution is discussed. The mid-infrared spectra of NGC1535, NGC6629, He2-108 and Tc1 taken with the Spitzer Space Telescope are presented. These spectra are combined with IUE and visual spectra to obtain complete extinction-corrected spectra from which the abundances are determined. These abundances are more accurate for several reasons, the most important is that the inclusion of the far infrared spectra increases the number of observed ions and makes it possible to include the nebular temperature gradient in the abundance calculation. The abundances of these PNe are compared to those found in five other PNe of similar properties and are further compared with predictions of evolutionary models. From this comparison we conclude that these PNe originated from low mass stars, probably between 1 and 2.5 solar masses and at present have core masses between 0.56 and 0.63 solar masses. A consistent description of the evolution of this class of PNe is found that agrees with the predictions of the present nebular abundances, the individual masses and the luminosities of these PNe. The distances to these nebulae can be found as well.

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