SULPHUR ABUNDANCES IN THREE HALO PLANETARY NEBULAE

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The intensities of the (S II) 6717, 31 Å and (S III) 9532 Å lines have been measured for the first time in the three known extreme halo planetaries. Preliminary estimates of the S/H ratios are: $(4.7 \pm 6.5) \times 10^{-7}$ for 108 - 76°1, $(1.4 \pm 0.6) \times 10^{-7}$ for K 648, and $(2.0 \pm 1.3) \times 10^{-7}$ for 49 + 88°1. The S/H ratio in K 648 (the planetary in M 15) is 0.014 of that measured in the Ring Nebula (Barker, 1980, Ap. J., 240, 99), consistent with the Fe/H abundance of about 1/100 solar found (Cohen, 1978, Ap. J. 223, 487) in the stars in M 15. The average of the S/O ratios in the halo planetaries is an eighth the value in the Ring Nebula, similar to the low Ar/O ratios found previously (Barker, 1980, Ap. J. 237, 482). The implication is either that the abundances of lighter elements such as O have been enhanced by nuclear reactions in the planetary progenitors or that S and Ar were synthesized galactically at a slower rate than lighter elements. In either case, it appears that S and Ar may be more representative of the true heavy metal abundances in planetaries than O.

PEIMBERT: This is an excellent piece of work: the S/H ratio provides us with a powerful constraint when studying the early chemical evolution of the Galaxy.

ALLER: Adjustments of the ionization correction factor in any reasonable manner could not modify the main conclusion: the sulphur abundance is down by two orders of magnitude.

DINERSTEIN: Following on from the previous remark, the ionization correction factors for these particular nebulae are small enough for the associated uncertainty to be very small and not affect your conclusion.

Let me also say that the study of argon and sulphur in PN and H II regions has much to gain from infrared observations, which are currently being pursued by several groups.

PEIMBERT: We find that the C/O ratio in these objects is up by almost an order of magnitude, which indicates that they have ejected mass from regions where complete or nearly complete helium burning has taken place. Therefore, at least part of the O/S and Ne/S excess could be due to the evolution of the progenitors.

BARKER: Yes. On the other hand, Ne/H is extremely low in 49 + 88°1, which you found to have a particularly high carbon abundance.

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