

CHEMICAL ABUNDANCE DETERMINATIONS IN GASEOUS NEBULAE

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The determination of the chemical abundances in planetary nebulae and HII regions from the observed intensities of emission lines usually needs a correction for the unseen ionization stages. An empirical correction was first introduced by Peimbert and Costero (1969) as a factor ICF (ionization correction factor) which was obtained assuming that ions with similar ionization potentials are equally populated. Recently, Natta et al. (1980) discussed the problem of sulphur abundance in nebulae and proposed an ICF for sulphur which takes into account the radiation field as well as the ionization equilibrium of O^+ , O^{++} , S^{++} and S^{+3} . However they did not consider the effect of the charge exchange reactions which can be very important in determining the ionization equilibrium of the gas (Péquignot et al., 1978).

In this paper calculations for the ICFs of N, O, Ne, S and A are presented following the method proposed by Natta et al. but introducing the charge transfer reactions (Butler et al., 1980; Butler and Dalgarno, 1980). For each object the ICFs depend on the effective temperature of the central star and on the ratio n_{HI}/n_e . Taking this ratio equal to 10^{-2} or 10^{-3} and the effective temperature indicated by the He lines, the method for determining abundances was applied for several planetary nebulae and HII regions. Our results are usually less than or equal to those previously obtained (French, 1981; Natta et al., 1980; Torres-Peimbert and Peimbert, 1977). Good agreement was obtained for O and A abundances.

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