total recombination coefficient might be expected at nebular temperatures. Recombination coefficients have been calculated in the temperature range from 5000 K up to the temperature at which the Burgess general formula becomes valid. The total dielectronic recombination coefficients are fitted to a simple function of the electron temperature.

RECOMBINATION SPECTRA OF PLANETARY NEBULAE

P.O. Bogdanovich, Z.B. Rudzikas
Institute of Physics of the Academy of Sciences of the Lithuanian SSR, Vilnius, USSR

T.H. Feklistova
W. Struve Astrophysical Observatory, Tartu, USSR

A.F. Kholtygin, A.A. Nikitin, A.A. Sapar
Leningrad State University, Leningrad, USSR

The lines of the transitions between the subordinate levels of the CIII, NIII etc. ions are observed in the spectra of planetary nebulae (PN) [1]. Their theoretical intensities may be found by solving the stationarity equations and accounting for both the recombination and cascade radiative transitions. It is possible to calculate the recombination spectra in various approaches: the single- or multi-configuration approximations (SCA and MCA) making use of both the superposition of configurations (SC) or the multiconfigurational Hartree-Fock-Jucys equations [2], taking into consideration the contribution of the dielectronic recombination to the intensities of the recombination lines. The energy spectra, the transition probabilities etc., as a rule ought to be calculated in the intermediate coupling scheme [2]. Both analytical or numerical (e.g. Hartree-Fock) wave functions may be adopted.

In the framework of the above-mentioned approximations we have calculated the probabilities of many transitions in the ions CIII, NIII, OIII etc. In Table 1 some transition probabilities (in 10^8 s^{-1}) are presented as examples.

The transition probabilities found were used for calculations of the intensities of the recombination lines of the ions under consideration. It turned out that the accounting for the correlation effects improves essentially the coincidence of the theoretical lines and those observed in the spectra of PN. Taking into account the two-electron transitions we can explain the appearance and calculate the intensities of the lines caused by the transitions from doubly excited configurations in CIII and NIII.

https://doi.org/10.1017/S0074180900094158 Published online by Cambridge University Press

Ion	Transition	$\lambda_{aver.}$	A_{SCA}	A_{SC}
CIII	$2p3p\ ^3P - 2s5f\ ^3F$	4156	0	1.3
CIII	$2s3s\ ^3S - 2s3p\ ^3P$	4650	0.88	0.74
NIII	$2p3s\ ^2P - 2p3p\ ^2D$	4192	1.3	-
NIII	$2s^23p^2P - 2s^23d^2D$	4640	1.1	-
OIII	$2p3p\ ^1P \quad 2p3d\ ^3F$	2984	0.75	-

Table 1.

Table 2 contains the relative intensities (calculated $I_{theor.}$ and observed $I_{obs.}$) of some recombination lines, taking I(4656) = 1 for CIII, I(4640) = 1 for NIII and T_e = 10 000°K, observed in the spectra of PN NGC 7027 (3).

CIII	I(5696)	I(8500)	I(4070)	I(4156)	I(4187)
$I_{theor.}$	0.01	0.001	0.85	0.17	0.33
$I_{obs.}$	traces	-	0.75	0.18	0.41
NIII	I(4097)	I(4379)	I(3999)	I(4192)	
$I_{theor.}$	0.5	0.12	0.1	0.02	
$I_{obs.}$	0.6-1.7	0.12-0.22	0.2	0.01-0.03	

Table 2.

The relative intensities of the recombination lines were used to determine the relative abundance $((X/H)\cdot 10^4)$ of the ions considered in more than 20 PN (4). Table 3 illustrates the results obtained.

PN	T_e	CIV	NIV	NV	C
7027	11500	6.4	17	0.65	17.8
7009	10600	5.8	27	-	18.1
2440	13500	7.8	38	3.0	-

Table 3.

https://doi.org/10.1017/S0074180900094158 Published online by Cambridge University Press

It turned out that for some PN the abundance of C and, probably, N is higher than in the Sun.

1. Seaton, M.J.: 1980, Q.J.R.A.S., vol.21, 229.
2. Nikitin, A.A., Rudzikas, Z.B.: 1983, Foundations of the theory of the spectra of atoms and ions, Nauka, Moscow (in press).
3. Kaler, J.B.: 1976, Ap. J. Suppl., vol.31, 517.
4. Nikitin, A.A., Sapar, A.A., Feklistova, T.H., Kholtygin, A.F.: 1981, Astron. Journ. (USSR), vol.58, 101.

RADIATIVE TRANSFER EFFECTS DUE TO CURVATURE AND EXPANSION IN A DUSTY PLANETARY NEBULA

A. Peraiah
Indian Institute of Astrophysics, Bangalore, India

We have investigated the effects due to curvature and radial expansion in a planetary nebula, with hydrogen and helium. We have solved the radiative transfer equation with spherically symmetric approximation in the rest frame. We have included dust in static as well as in expanding media. The effects on the internal sources and the mean intensities at the internal points have been calculated. It is found that the effect due to the presence of dust is to reduce the mean intensities, and curvature effects on the internal sources are more pronounced than the effects due to radial expansion of the gas.

PROFILES AND INTENSITY RATIOS OF THE C IV λ1548, 1550 EMISSION LINES IN PLANETARY NEBULAE

W.A. Feibelman
Laboratory for Astronomy & Solar Physics, NASA-Goddard Space Flight Center, Greenbelt, Maryland 20771, USA

The C IV resonance doublet at λ1548, 1550 is an important diagnostic tool in the study of planetary nebulae. The predicted theoretical intensity ratio of 2 : 1 is, however, rarely observed in high dispersion