NITROGEN ABUNDANCE AND RECOMBINATION LINES IN NOVA SHELLS

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Non-hydrogenic permitted transition probabilities and recombination coefficients of N II have been calculated using a model potential for a multielectron ion (Victor and Escalante 1988, *Atomic Data and Nuclear Data Tables*, **40**, 227; Victor and Escalante 1989, in preparation; Caves and Dalgarno 1972, *J. Quant. Spectrosc. Radiat. Transfer*, **12**, 1539). This allows the calculation of intensities of N II lines produced by electron recombination or radiative excitation and subsequent decay of the excited states. The two-electron transition probabilities and dielectronic recombination coefficients computed by Nussbaumer and Storey (1984, *Astr. and Ap. Suppl.*, **56**, 293) were also included in the calculations. In the limiting cases in which N II resonant transitions are optically thick or thin, the intensities of non-resonant recombination lines are proportional to the effective recombination coefficient, the electron density and the abundance of the N III ion.

By comparing relative intensities of N II lines, it is possible to determine whether the lines are produced by electron recombination in a manner nearly independent of assumed physical conditions. When the excitation mechanism is electron recombination, the relative N II abundance can be determined by comparison with Balmer lines. Recombination lines are weakly dependent on temperature. Thus abundance determinations using recombination lines during the nebular shell stage are more reliable and give more consistent results than analyses of observations of other stages of the nova outburst.

We compare reported measurements of N II emission line intensities in resolved nova shells in the nebular phase with theoretical calculations of the emission spectra, and show that the relative intensities of the lines are consistent with the mechanism of excitation by electron recombination of N III and not by flourescence. Because of the low temperature of the shells, the forbidden lines are also excited by electron recombination. The observed line intensities indicate a high nitrogen content in nova shells, N/H $\sim$ 0.05, in qualitative agreement with abundance determinations of earlier stages of nova outburst.

THREE NEW PLANETARY NEBULAE FROM THE IRAS POINT SOURCE CATALOGUE

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From low resolution spectroscopy, three new planetary nebulae have been found, when carrying out a survey of IRAS sources with infrared colours like planetary nebulae. IRAS 16455–3455 is a high excitation planetary nebula with chemical abundances similar to the mean values found for planetaries in the Galaxy. IRAS 15154–5258 is a hydrogen-poor nebula with a high infrared excess. The central star shows emission features of a WC4 Wolf-Rayet star. In the case of IRAS 18186–0833 the excitation is low and it seems to present a high helium abundance.

A NEW HALO PLANETARY NEBULA

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A new halo planetary nebula at R.A. = 21 hrs 02 min 44.5 sec and declination = –37° 20' 37" (equinox 1950.0), corresponding to galactic coordinates l^{II} = 6°. 165 and b^{II} = –41°.957, is presented. Spectrophotometric data have been obtained during 1988, with the CTIO 4-m telescope equipped with a R–S spectrograph and CCD detector. We have estimated a diameter of 8".2 for the nebula and the central star has a visual magnitude $V \cong 17$ mag. The reddened Hβ flux, observed through a 2" × 2".5 slit centered on the object, is log F(Hβ) = –13.80.

From spectrophotometric data, we have derived the logarithmic reddening correction, c(Hβ) = 0.15 ± 0.05, and the electron temperature, T(O III) = 15000 K ± 1500 K. The electron density has been assumed to be N_e = 500 cm^{-3}. By the usual procedures, we obtained the following nebular chemical composition:

log He/H = 10.96 ± 0.05, log O/H = 8.10 ± 0.10, log Ne/H = 7.5 ± 0.2 and log Ar/H = 5.8 ± 0.2. The O, Ne and Ar appear underabundant by a factor of 5, relative to solar abundances. These results indicate that PN 6 −41.1 is a population II object with chemical composition comparable to the SMC H II regions and very similar to the only known C poor halo planetary nebula DDDM-1.

From nebular parameters we have estimated that the distance to the object is in the range 2.8 kpc ≤ d ≤ 18 kpc, corresponding to a galactic plane distance range of 1.9 kpc ≤ | z | ≤ 12 kpc. On the other hand, from the characteristics of the central star, we derived a distance d ≅ 7.7 kpc, with | z | ≅ 5.1 kpc, which we consider is the most probable distance to the object. This distance estimate places the nebula in the galactic halo. The complete version of this work appears in *Revista Mexicana Astron. Astrof.*,**17**, 1989.

AGE STRUCTURE OF REFRACTORY INTERSTELLAR DUST AND ISOTOPIC CONSEQUENCES

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We compute the mean age of dust particles using a sputtering and recycling Monte Carlo model developed by Liffman, and Clayton, (1988, *Proc. Lunar Planet. Sci. Conf.*, **18**, 637). Each particle mean age is defined not as the time it has existed, but rather as the mass-weighted existence times of its parts (core plus shell) at t = 6 Gyr when the Solar System formed in our models. We show that galactic evolution generates a correlation between particle size and mean age. This is a mean correlation, applying to large numbers of particles binned according to size rather than to individual particles, whose mean ages fluctuate statistically. The cosmochemical consequence is that if interstellar particles can be dynamically sorted into separate size populations during the aggregation history of solar system bodies, the collections of larger grains will constitute matter that is chemically older than collections of smaller grains. This macroscopic age difference generates isotopic anomalies by virtue of the time dependence of the secondary/primary nucleosynthesis yields (Clayton, 1988, *Ap. J.*, **334**, 191). The most important example is that an aggregate of refractory oxides is several percent richer in ^{16}O than is the solar gas, ranging up to 10% richer in Al_2O_3 if Al is also concentrated into larger-than-average particles. This history may explain the 5% richness of ^{16}O within meteoritic Al-rich inclusions. We compare our results with three different prescriptions for the sputtering of interstellar dust.

IUE OBSERVATIONS OF WOLF–RAYET BINARIES IN THE GALAXY, THE LMC AND THE SMC

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Due to the large extent of the winds of W–R stars, atmospheric eclipses are evident at *UV* line frequencies in binary systems containing an O–star companion. In 8 of the galactic WR's thus far studied with the *IUE* satellite, the presence of very numerous, closely spaced lines of Fe IV, Fe V and Fe VI lead to pseudo-continua which are most evident during the atmospheric eclipses, even in the lowest inclination binary systems. We report on the results of *IUE* observations of the systems HD 36402 in the LMC, and HD 5980 and Sk 188 in the SMC where no evidence is found for the iron pseudo-continua, although atmospheric eclipse effects are relatively strong at line frequencies corresponding to ions of N IV, C IV and O IV. This is consistent with the lower heavy-metal abundances in the Clouds with respect to the Solar vicinity.

THE DISTANCES TO HIGH VELOCITY CLOUDS: A MODEL FOR THEIR CONFINEMENT

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The assumption that the High Velocity Clouds are embedded in the hot galactic gaseous halo, and in pressure equilibrium with it, permits the determination of a distance to the clouds.

Being in pressure equilibrium with the surrounding medium means that the total external pressure equals the pressure within the cloud. That is, we are assuming no expansion or contraction of the cloud.

In this model the external pressure has two components. One is the thermal pressure of the hot surrounding gas, and the other is the ram pressure due to the drag of the material they find in their trajectories. This external pressure depends on the distance because the distribution of the coronal gas is not uniform.

From the parameters observed for each individual cloud (column density, line width, angular size and velocity with respect to the galactic standard of rest) we obtained the internal pressure as a function of distance