CHEMICAL COMPOSITION OF NOVA CENTAURI 1986

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SUMMARY

We have obtained extensive spectroscopic observations of Nova Cen 1986 at different phases of the event.

From the observed Hα/Hβ line ratio we derived a colour excess $E_{B-V} = 0^m.54$. Using the empirical relationship between the fading time and the absolute magnitude at maximum light as well as the width of the NaI interstellar lines, we estimated for the nova a distance of 1.2 ± 0.2 kpc. The full-width of non-blended lines at the nebular phase indicates an expansion velocity of 1400 ± 120 km s^{-1}.

The temporal behaviour of the Hβ emission suggests that the electron density varies with time as $Ne \propto t^{-3}$, i.e., the shell evolves more or less homologously. The electron temperature was estimated from the [NII] and [OIII] line ratios. In the O^{+2} region the electron temperature is in the range 14100 ± 1200 K. The N^+ region has a lower temperature, T ≃ 8000 K around day 142 after maximum light. The N^+ temperature increases in this region as the shell evolves and attains the same values observed in the O^{+2} region around days 300-470.

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From the observed line ratios, we have derived the following elemental abundance ratios:

$$\frac{He}{H} = 0.17 \pm 0.03$$

$$\frac{O}{H} = (2.2 \pm 0.8) \times 10^{-3}$$

$$\frac{N}{H} = (2.1 \pm 0.6) \times 10^{-3}$$

$$\frac{Fe}{H} = (3.2 \pm 0.7) \times 10^{-5}$$

These results indicate that helium, nitrogen and oxygen are enhanced in the ejecta, with respect to the solar values. The N/O ratio suggests that the outburst was powered by the CNO cycle and that the progenitor was a C-O white dwarf.

The abundance determinations were made within days 142 and 561. No significant temporal variations were observed excepting for oxygen whose abundance seems to decrease with time (the N/O ratio increases). It is possible that oxygen may partially be locked into grains.

A full version of this work will appear in the Astrophysical Journal.

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