



# Is the post-AGB star SAO 40039 mildly H-deficient?

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We have conducted an LTE abundance analysis for SAO 40039 a warm post-AGB star whose spectrum is known to show surprisingly strong He I lines for its effective temperature and has been suspected of being H-deficient and He-rich. High-resolution optical spectra are analyzed using a family of model atmospheres with different He/H ratios. Atmospheric parameters are estimated from the ionization equilibrium set by neutral and singly ionized species of Fe and Mg, the excitation of Fe I and Fe II lines and the wings of the Paschen lines. On the assumption that the He I lines are of photospheric and not chromospheric in origin, a He/H ratio of approximately unity is found by imposing the condition that the adopted He/H ratio of the model atmosphere must equal the ratio derived from the observed He I triplet lines at 5876, 4471 and 4713 Angstrom, and singlet lines at 4922 and 5015 Angstrom. Using the model with the best-fitting atmospheric parameters for this He/H ratio, SAO 40039 is confirmed to exhibit mild dust-gas depletion, i.e., the star has an atmosphere deficient in elements of high condensation temperature. The star appears to be moderately metal-deficient with  $[Fe/H]=-0.4$  dex. But the star's intrinsic metallicity as estimated from Na, S and Zn, elements of a low condensation temperature, is  $[Fe/H]_o$   $\{[Fe/H]_o$  refers to the star's intrinsic metallicity $\} \sim -0.2$ . The star is enriched in N and perhaps O too, changes reflecting the star's AGB past and the event that led to He enrichment.

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