

Relative CNO Abundances in Upper AGB Stars of the Magellanic Clouds.
A Search for Envelope Burning

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We have investigated the atmospheric abundances of upper AGB stars of the SMC, searching in particular for evidence of the hypothetical envelope burning process. To this end we have computed synthetic spectra with varying C, N, and O abundances selected by considering the effect of the processes of the 3rd dredge up and envelope burning of a degree sufficient to prevent C star formation. The synthetic spectra (covering 0.5 μm to 2.5 μm) were analysed for observable effects of these two atmospheric enrichment processes. By analysis of band strengths of TiO, CO and CN we have found that substantial envelope burning is detectable for stars with $T_{\text{eff}} \geq 3000$ K but not below, due to the temperature dependence of CN bands. The synthetic spectra were compared to near-infrared and infrared observations of a small sample of SMC upper AGB stars thought to be prime candidates for the occurrence of envelope burning. This comparison indicated that envelope burning, of the extent considered here, is not occurring in these stars but rather the spectra are consistent with mild C enhancements produced by the 3rd dredge up alone.

However, the use of CN bands limits us to $T_{\text{eff}} \geq 3000$ K and our model atmospheres restrict us to C/O ratios below 1.0. Until these restrictions are lifted (in future work) it is not possible to discount in general the occurrence of envelope burning on the upper AGB.

We present a condensed version of this work, the full account of which is currently being prepared for journal submission.