Carbon- and Oxygen-Rich Stars in the IRAS Two-Color Diagram: Results from Hydrodynamical Models of AGB Winds

M. STEFFEN[1], R. SZCZERBA[2], A. MEN'SHCHIKOV[1,3], and D. SCHÖNBERNER[1]

[1] *Astrophysikalisches Institut Potsdam, Germany*
[2] *Nicolaus Copernicus Astronomical Center, Toruń, Poland*
[3] *Max-Planck-Gesellschaft, Jena, Germany*

Based on detailed stellar-evolution calculations including mass loss on the AGB (Blöcker 1995, *A&A*, 297, 727), we have investigated the structure, dynamics and spectral energy distribution of dusty circumstellar shells around stars in the final stages of their AGB evolution.

The wind is assumed to be driven by radiation pressure on dust grains and subsequent momentum transfer to gas molecules by collisions. Given the fundamental stellar parameters $(M, L, T_{\rm eff})$ and the mass loss rate $(\dot{M})$, a physical model of this wind is obtained from the self-consistent solution of the radiative transfer problem and the dynamical problem, using a time-dependent two-component (dust/gas) hydrodynamics code.

By this method we can study the dynamical response of the circumstellar dust/gas shell to variations of the stellar parameters and mass loss rate occurring in the course of stellar evolution. We find that the large variations of L and $\dot{M}$ associated with the final thermal pulses near the end of the AGB evolution lead to characteristic, time-dependent signatures in the density structure and can explain the existence of *detached dust shells*.

We present the resulting "loops" in the IRAS two-color diagram for different assumptions concerning the composition (amorphous carbon, graphite, astronomical silicates) of the dust grains and for tracks with different initial stellar mass in comparison with the observed colors of carbon-rich and oxygen-rich stars.

https://doi.org/10.1017/S0074180900003430 Published online by Cambridge University Press