New Results from the Modeling of the Shell around IRC +10216

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A spherically symmetric dust radiative transfer code is used to model the circumstellar dust shell around IRC +10216. Compared to numerous previous models a much larger body of observational data is used as constraints. The spectral energy distribution between 0.5 and 60000 μm, 2–4 μm and 8–23 μm spectra, optical, far-infrared and centimeter sizes, and interferometric visibility curves between 1.6 and 11.2 μm are used to constrain the model.

Key results are:

- In order to fit the visibility curve at 2.2 μm and the size of the shell in the optical, scattering has to be invoked. The strong dependence of the scattering coefficient on grain size allows one to derive a mean grain size of 0.16 ± 0.01 μm.
- Previous suggestions that the mass loss rate was higher in the past are confirmed. The principal argument is that with an r^{-2} model the calculated far-infrared sizes are smaller than observed.
- Regarding the cm emission it is found that in small apertures dust emission is negligible for wavelengths $\gtrsim 2$ cm. Free-free emission is negligible for wavelengths $\lesssim 0.5$ cm. The free-free emission is found to be optically thin even at 6 cm. An ionization fraction of 7.8×10^{-5} is derived which, according to the Saha equation, corresponds to an electron temperature of about 2400 K. Although there are uncertainties in the free-free emission model, this suggests that the free-free emission does not come from a chromosphere.

This research is discussed further in Groenewegen (1996, *A&A*, 305, L61) and Groenewegen (1997, *A&A*, 317, 503).

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