

On the nature of carbon stars

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This paper is concerned with the nature of carbon stars. Data from the IRAS survey have shown that carbon stars which were identified from optical surveys and those identified from the SiC dust features in their IRAS-LRS spectra have different IRAS colours. The former (which be referred to as visual carbon stars) are visually bright and have large excesses at 60 μm , while the later group (which will be referred to as infrared carbon stars) have blackbody energy distributions. Model calculations are presented on the evolution from the visual carbon stars to infrared carbon stars, and on the evolution of infrared carbon stars. A two-shell model (the interrupted mass-loss model) has been developed with an oxygen-rich detached shell and a newly forming SiC dust shell. The model tracks successfully explain a “C”-shaped distribution of carbon stars in the colour-colour diagram. The existence of these transition objects with infrared properties intermediate between visual and infrared carbon stars, lends further support to the idea of an evolutionary link between visual and infrared carbon stars. For some objects in the working sample observational data (such as ISO, IRAS and optical near-infrared photometry) are available. The energy distributions generated by the model are compared with the available data of these objects. This comparison will be presented and discussed. The data from FIRST will be very useful for further investigating this idea in details.