Abstract

Dust play an important role in late stages of stellar evolution. In particular, it has a pronounced influence on the mass loss of late type giant stars and as such is one of the key factors in determining the evolution and fate of these objects. Therefore it is essential to understand basic dust properties and especially the optical properties of the dust grains which are expected to form in these type of stars is essential. This thesis is devoted to both, laboratory experiments to obtain some of the necessary basic dust properties and calculating theoretical atmospheric models with the obtained spectral properties of the grains included.

Two different dust types were studied in the laboratory; diamonds and silicon carbide. The spectral appearance of presolar diamond and silicon carbide extracted from meteoritic material was determined and compared to diamonds and silicon carbide produced in the laboratory in order to get a better understanding of some of the basic physical properties of these two types of presolar grains. The laboratory produced SiC samples was studied intensively to provide a good understanding of the influence of grain shape, sizes, crystal-types, impurities and the influence of using a matrix in the laboratory measurements.

The data obtained in the laboratory was used in two different theoretical atmospheric model calculations for carbon rich late-type stars: (1) A self-consistent hydrostatic photospheric model calculation with the diamond data included. It was found that although the diamonds should not be expected to show up in observed spectra of carbon stars, they never-the-less have a significant influence on the photospheric structure of the star. (2) A self-consistent hydrodynamic atmosphere model with some of the silicon carbide data included and which also used selected laboratory amorphous carbon data. In these particular models the mass loss rates are not severely dependent on the difference in the optical properties of the dust, but the influence on the degree of condensation and the final outflow velocity as well as on the synthetic colours is considerable.

Anja C. Andersen, Copenhagen Astronomical Observatory, Copenhagen University, Juliane Maries Vej 30, DK–2100 Copenhagen, Denmark