Measurements of High-Temperature Optical Constants of Solar-Nebula Minerals

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Many dust species – among them refractory oxides – are known to form and to radiate at temperatures much higher than 300 K. Nevertheless, many astrophysical studies are based on the room temperature optical constants of solids such as corundum and spinel. A more realistic approach is needed for these materials, especially in the context of modelling late-type stars.

We aimed at deriving sets of optical constants of selected, astrophysically relevant oxide dust species with high to very high melting points. Therefore, temperature-dependent infrared (IR) reflection measurements have been performed in a special high-temperature-high-pressure cell built into a Fourier-transform IR spectrometer on polished samples of corundum (α-Al_2O_3), spinel ($MgAl_2O_4$) and α-quartz (SiO_2). Reflection spectra have been measured from room temperature up to 973 K in a wavelength range from 5 - 50 μm. Optical constants and finally small particle spectra of the minerals have been calculated from these data and were compared to astronomical spectra.

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