Infrared Emission Spectroscopy of Hot Grains in the Laboratory

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We recently launched a project that aims to contribute to the characterization of hot dust grains observed in astrophysical objects, in particular hot exozodiacal dust disks (exozodis). Exozodis are frequent (Kral et al. 2017), and they appear to consist of submicron-sized grains (Kirchschlager et al. 2017) that can reach a temperature of 2000 K (Ertel et al. 2018) at the point closest to the central star. The composition and hence the origin of these grains are currently undetermined.

As hot dust is typically revealed by its thermal emission at near- and mid-infrared wavelengths (e.g., Kirchschlager et al. 2017), we intend to obtain the optical constants of relevant materials at high temperatures, up to 1800 K, in the infrared wavelength range. These constants will allow us to compute thermal emission spectra for grains of these materials, taking various geometries and sizes into account, which we will compare to astronomical observation data in order to identify or constrain the nature of hot exozodis.

We can currently measure Fourier-transform infrared (FTIR) thermal emission spectra of grains on a flat substrate heated to temperatures up to 800 K. Initial measurements focused on monolayers of monodisperse SiO_2 glass microspheres (Tamanai et al. 2026), and the study of SiC nanoparticles is underway. We will present our project in detail and report on the first measurements.

References

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