

INFRARED SPECTROSCOPY OF COSMIC GRAINS — CONTRIBUTIONS FROM LABORATORY ASTROPHYSICS

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Observations with the spectrometers on-board the Infrared Space Observatory (ISO) led to a breakthrough in our understanding of the chemical composition and the lifecycle of cosmic grains. Now, an inventory of cosmic ices is possible and the nature of polycyclic hydrocarbons and oxidic grains is better understood. However, there are quite a lot of spectral features the carriers of which are still not identified. The mineralogy and the corresponding optical properties of cosmic dust play an important role for the appearance of dust-enshrouded objects which range from comets to ultraluminous infrared galaxies. The presence of dust particles also determines the temperature, ionization state, and the chemistry of the denser phases of the interstellar and circumstellar media.

The ISO observations convincingly demonstrated that an adequate interpretation of astronomical infrared data is not possible without the availability of relevant laboratory data. The review will show how optical data can be obtained by laboratory measurements on materials collected in situ in the solar system and by measurements of cosmic dust analogs. The necessary basic knowledge how optical data of small particles can be measured and how they should be applied to solve astrophysical problems will be provided. In addition, the different mechanisms causing the transition from amorphous to crystalline dust components will be discussed.