

THz TIME-DOMAIN SPECTROSCOPY OF COMPLEX INTERSTELLAR ICE ANALOGS

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It is generally accepted that complex organic molecules (COMs) form on the icy surface of interstellar grains. Our ability to identify interstellar complex species in the ices is affected by the limited number of laboratory analogs that can be compared to the huge amount of observational data currently coming from international astronomical facilities, such as the Herschel Space Observatory, SOFIA, and ALMA. We have recently constructed a new THz time-domain spectroscopy system to investigate the spectra of interstellar ice analogs in a range that fully covers the spectral bandwidth of the aforementioned facilities (0.3 – 7.5 THz). The system is coupled to a FT-IR spectrometer to monitor the ices in the mid-IR (4000 – 500 cm^{-1}). This talk focuses on the laboratory investigation of the composition and structure of the bulk phases of interstellar ice analogs (i.e., H_2O , CO_2 , CO , CH_3OH , NH_3 , and CH_4) compared to more complex molecules (e.g., HCOOH , CH_3COOH , CH_3CHO , $(\text{CH}_3)_2\text{CO}$, HCOOCH_3 , and HCOOC_2H_5). The ultimate goal of this research project is to provide the scientific community with an extensive THz ice database, which will allow quantitative studies of the ISM, and potentially guide future astronomical observations of species in the solid phase.