CONTROL ID: 2227225

TITLE: Infrared Spectroscopic Studies of Water and Organics in Protoplanetary Disks around Young Stars

ABSTRACT BODY:

Abstract Body: The building blocks of planets in planet-forming ("protoplanetary") disks are assembled early in the lifetime of a young star. The gas disks are relatively short-lived, with a half-life of about 3 million years, as chemical reactions modify the reservoir of material from the natal molecular cloud. 5 - 7.5 μm wavelength *Spitzer Space Telescope* Infrared Spectrograph (IRS) spectra of about a dozen T Tauri stars in the Taurus-Auriga star-forming region showing emission from water vapor and absorption from other gases in these stars' protoplanetary disks will be presented. Some of these stars' spectra show a strong emission manifold at 6.6 μm due to the nu_2 = 1 - 0 bending mode of water vapor, with the shape of the spectrum suggesting water vapor temperatures > 500 K. Other stars' spectra show a strong absorption band, peaking in strength at 5.6 - 5.7 μm, which appears consistent in some cases with gaseous formaldehyde (H_2CO) and in other cases with formic acid (HCOOH). Modeling of these stars' spectra suggests these gases are present in the inner few AU -- i.e., in the planet-forming regions -- of their disks. How the gaseous features observed between 5 - 7.5 μm relate to those at other wavelengths will be discussed. Future directions for this research, including both pursuing confirmation of HCOOH and H_2CO features at these and other wavelengths and modeling of the gas features at these wavelengths in other *Spitzer*-IRS spectra of protoplanetary disks around young stars, will also be discussed. This work suggests that water and organic molecules, which are crucial for life as we know it, are present in the habitable zones of stars at a very early age [of 1-3 million years].

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PRESENTATION TYPE: Oral