ROVIBRATIONALLY RESOLVED INFRARED SPECTROSCOPY OF AROMATIC MOLECULES OF POTENTIAL PREBIOTIC AND INTERSTELLAR IMPORTANCE: THE FTIR SPECTRUM OF PYRIMIDINE

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Space-based observatories like the Infrared Space Observatory (ISO) and satellite missions like Cassini to Titan give us new insights into interstellar and planetary chemistry, the synthesis of "prebiotic" molecules and thus their role in the origin of life. One of the most challenging tasks is the identification of molecules which are important in the synthesis of biomolecules like DNA. A prominent species is pyrimidine ($C_4H_4{}^{14}N_2$). Pyrimidine has not yet been unambiguously identified in the interstellar medium by microwave spectroscopy[a]. For that reason we provide new high resolution infrared spectra of pyrimidine[b] which may make it possible to confirm the detection of extraterrestial pyrimidine in the infrared region. We have recorded the spectrum of pyrimidine in the region 600-3600 cm^{-1} with our Zürich Bruker 2001 prototype Fourier transform infrared spectrometer[c] with an instrumental resolution of 0.0008 cm^{-1}, essentially Doppler-limited, with Doppler widths ranging from 0.0008 to 0.0015 cm^{-1}. The analysis of the bands located at $\tilde{\nu}_c = 714.54106$ cm^{-1} (ν_4) and $\tilde{\nu}_c = 803.97947$ cm^{-1} (ν_{10b}) will be discussed. The ν_{6b} band rotationally assigned by Kisiel et al.[d] was also analysed ($\tilde{\nu}_c = 620.54976$ cm^{-1}). In addition, we have measured the rovibrationally resolved FTIR spectra of other aromatic compounds containing heteroatoms like aniline (C_6H_7N)[e], phenol (C_6H_6O), and benzaldehyde (C_7H_6O) in the range 600-1300 cm^{-1}. We will show an initial assignment of these spectra, which are rather complicated due to the excitation of inversion and torsion modes. In this context we will discuss the absorption features in the region between 650 and 1000 cm^{-1} detected in the ISO spectra from the proto-planetary nebula CRL 618[f].

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