HOT METHANE SPECTRA AND APPLICATIONS IN ASTROPHYSICS

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Absorption bands from hot methane are prominent in the infrared spectra of many brown dwarfs and are expected to occur in the infrared spectra of extrasolar planets. We have recorded new laboratory high resolution Fourier transform spectra of methane emission at three temperatures (1273 K, 1000 K, and 800 K) and identical pressures, spanning the region of 2050-6400 cm^{-1}. Line positions and approximate intensities have now been determined for all three spectra. At each temperature, bands were observed centered near 3000 cm^{-1}, 4200 $\mathrm{cm}^{-1}$and 6000 cm^{-1}, with much reduced self-absorption compared to our earlier attempts. Spectra of methane at high temperature differ significantly from room temperature spectra presented in the form of linelists in HITRAN. We expect our lab data to be much more useful than room temperature linelists for understanding the spectra of brown dwarfs, modeling the atmospheres of hot extrasolar giant planets and other high temperature applications.