THE ZÜRICH HIGH RESOLUTION COLLISIONAL-COOLING CELL-FTIR SETUP: ROVIBRATIONAL SPECTROSCOPY OF METHANOID MOLECULES BETWEEN 60 AND 300 K

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A complete understanding of the absorption behavior of the Earth's atmosphere and of the atmospheres of the giant planets (Saturn and Jupiter) and their moons (Titan) requires a detailed spectroscopic investigation of methanoid molecules over full atmospheric temperature ranges. For that reason we have interfaced a collisional and enclosive cooling cell[a] based on White-type multireflection optics to our FTIR IFS125 HR prototype 2001 spectrometer[b] (MOPD=10 m). This cell makes it possible to record spectra at high spectral resolution in the temperature range 4-400 K with absorption path lengths up to 20 m. We have recorded the spectra of CH_4[c] and its isotopomers[d] and of CHF_3[e], $CHClF_2$[f] and $CHCl_2F$[a] between 2000 and 6000 cm^{-1} in the temperature range 60-300 K. The spectra were recorded at resolutions ranging from 0.0015 to 0.004 cm^{-1}. We will present an analysis of the spectra of $CHCl_2F$ in the $2\nu_3$ and $3\nu_3$ regions and an initial assignment of the resonance system $2\nu_3/\nu_3+\nu_8/2\nu_8$ of $CHClF_2$. We discuss coincidences with CO_2 laser lines in the $2\nu_3$ region of the isotopic chiral molecule $CH^{35}Cl^{37}ClF$. Doppler-free quasi-resonantly enhanced ultra-high two-photon absorption experiments may be carried out in this region to study parity violation[g] in this molecule. In addition, we show CO nanoparticles recorded at 6 K [h].

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