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Title:Doppler limited rotational transitions of OH and SH radicals measured by continuous-wave terahertz photomixing
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Abstract:A continuous-wave terahertz (CW-THz) source generated by photomixing has been employed to detect and quantify radicals produced in a cold plasma probing their spin-rotation transitions. Due to their dual interest for both atmospherists and astrophysicists, the hydroxyl OH and the mercapto SH radicals have been chosen. The photomixing technique which can access the largest range of THz frequencies of any known coherent source, allowed to resolve the Doppler-limited hyperfine transitions of OH in the 2.5 THz frequency region. Line profile analysis of the hyperfine components demonstrated that OH radicals have been detected in this region at a ppm level at a temperature close to 490 K. The hyperfine structure of SH has been resolved for the first time above 1 THz. Ten new frequency transitions have been measured in the 1.3-2.6 THz frequency range using the CW-THz synthesizer based on a frequency comb. With relative uncertainties better than 10-7, the CW-THz frequencies measured in this study are now competitive with those measured by other instruments such as frequency multiplication chains or FT-FIR spectrometers and are now capable to improve the predictions of the complete high-resolution spectra of these radicals collected in the atmospheric and astrophysical spectroscopic databases. versioncorrigeeAC 2011-07-18 17:32
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