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Title:Accurate rotational rest-frequencies of CH<inf>2</inf>NH at submillimetre wavelengths
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Abstract:Context. Methanimine (CH<inf>2</inf>NH) has been detected in different astronomical sources, both galactic (as in several "hot cores", the circumstellar enevolope IRC+10216, and the L183 pre-stellar core) and extragalactic, and is considered a pre-biotic interstellar molecule. Its ground-state rotational spectrum has been studied in the laboratory up to 172 GHz, well below the spectral ranges covered by Herschel/HIFI and the ALMA bands 9 and 10. Aims. In this laboratory study, we extend into the submillimetre-wave region the detection of the rotational spectrum of CH<inf>2</inf>NH in its vibrational ground state. Methods. The investigation was carried out using a source-modulation microwave spectrometer equipped with a cell coupled to a pyrolysis apparatus working at 1150 °C. The spectrum was recorded in the frequency range 329-629 GHz, with the detection of 58 transitions. Results. The newly measured transition frequencies, along with those available from previous microwave studies, allow us to determine fairly accurate rotational constants of CH<inf>2</inf>NH and the complete sets of quartic and sextic centrifugal distortion constants, in addition to two octic constants. Several transitions have an hyperfine structure due to the ¹⁴N nucleus, which was accounted for in the analysis. Conclusions. The determined spectroscopic constants make it possible to build a list of very accurate rest-frequencies for astrophysical purposes in the THz region with 1σ uncertainties lower than 0.01 km s⁻¹ in radial equivalent velocity. © 2012 ESO.
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