PURE ROTATIONAL TRANSITIONS OF METHYLENE (CH_2) IN THE TERAHERTZ REGION

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We report on recently performed high-resolution spectroscopic measurements on the methylene radical (CH_2) near 2 THz.
CH_2 plays an important role in interstellar chemistry modells and is thought to be an ubiquitous tracer of cold interstellar gas. Since CH_2 is a very light asymmetric rotor, appropriate transitions between low lying rotational energy levels happen to appear in the Terahertz region.
With the Cologne Sideband Spectrometer for Terahertz Applications (COSSTA) two pure rotational transitions involving energetically low lying rotational states in the vibrational and electronic ground state ($^3B_1$) have been recorded. One of those, the $N_{KaKc} = 1_{10} \leftarrow 1_{01}$ transition is centered at 1.915 THz. The upper level is the energetically lowest emitting level of *para*-CH_2; five of the six fine-structure components have been detected. The other transition, the $N_{KaKc} = 2_{11} \leftarrow 2_{02}$ multiplet of *ortho*-CH_2, centered at 1.954 THz, is further split due to hyperfine interaction. A total of 23 lines has been assigned for this transition.[a]
A short description of the experimental setup will be given, especially in view of the adoption of Zeeman modulation at COSSTA for the first time.
The characterization of the rotational spectrum of CH_2 with the aid of a standard Watson type Hamiltonian is challenging due to large centrifugal distortion terms and sparse experimental data. Recent progress towards a global fit of the spectroscopic data to microwave accuracy will be presented.

[a] S. Brünken, E. A. Michael, F. Lewen, T. Giesen, H. Ozeki, G. Winnewisser, P. Jensen, and E. Herbst *Can. J. Chem.*, June 2004, submitted.