Terahertz spectroscopy of hydrogen sulphide

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New experimental pure rotational transition frequencies of H_2S in its ground and first excited vibrational states were recorded at room temperature with the 0.005 cm^{-1} resolution in the region 45 to 360 cm^{-1} with a globar continuum source at SOLEIL synchrotron [1]. These pure rotational transitions have been found to belong to the four isotopologues $H_2{}^{32}S$, $H_2{}^{33}S$, $H_2{}^{34}S$ and $H_2{}^{36}S$ observed in natural abundance. 65% of the measured lines belonging to the ground vibrational state were assigned for the first time, sampling levels as high as J = 26 and K_a = 17 for $H_2{}^{32}S$, containing the first identified 91 rotational transitions of the rare isotopologue $H_2{}^{36}S$. 406 pure rotational lines of $H_2{}^{32}S$ and $H_2{}^{34}S$ from the first excited bending vibrational state were observed and assigned for the first time as well, with some of these transitions belonging to new experimental energy levels. We present comprehensive comparisons with the data available in HITRAN 2008, CDMS, and JPL databases as well as in the literature. Our new transitions have been included in the 2012 update of the HITRAN database.

[1] A. A. A. Azzam, S. N. Yurchenko, J. Tennyson, M. Martin-Drumel and O. Pirali. *J. Quant. Spectrosc. Radiat. Transf.*, **2013**, 131.