FT-UV emission spectroscopy of the $B^2\Sigma^+ - X^2\Sigma^+$ system of $^{12}C^{16}O^+$ and $^{12}C^{17}O^+$

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Abstract

The CO^+ molecule is a cation of the second most abundant molecule in space, carbon monoxide. The main isotopologue i.e. $^{12}C^{16}O^+$ was successfully detected towards the interstellar medium (ISM) by the lowest rotational transitions and also in the comets by the $A^2\Pi_i - X^2\Sigma^+$ system bands (see [1] and references therein). There is no evidence about the presence of the $^{12}C^{17}O^+$ cation in space. However, CO molecules bearing the isotope seventeen of oxygen have already been detected in ISM, despite a very low natural abundance of the ^{17}O (about 0.04%).

The CO^+ isotopolgues have been studied recently in the Materials Spectroscopy Laboratory at the University of Rzeszów trough the $B^2\Sigma^+ - X^2\Sigma^+$ system using FT-UV emission spectroscopy technique: $^{12}C^{16}O^+$ [1] and $^{12}C^{17}O^+$ [this work]. In total, about 1000 ro-vibronic transitions, belonging to the $0-0$, $0-1$, $0-2$ and $0-3$ bands, have been measured with an absolute accuracy of 0.005–0.010 cm^{-1}. The experimental data were analyzed using the `PGOPHER` program [2], which resulted in a set of high accuracy molecular constants and ro-vibronic level positions for the $X^2\Sigma^+$, $\nu = 0-3$ and $B^2\Sigma^+$, $\nu = 0$ levels for both isotopologues.

References

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2. C.M. Western, PGOPHER: A program for simulating rotational, vibrational and electronic spectra. J. Quant. Spectrosc. Radiat. Transf. 186:221–42 (2018). DOI: 10.1016/j.jqsrt.2016.04.010.