

FT spectroscopy of the comet-tail ($A^2\Pi_i \rightarrow X^2\Sigma^+$) system bands in $^{12}\text{C}^{17}\text{O}^+$

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In the emission spectrum of $^{12}\text{C}^{17}\text{O}^+$ molecule new observations and analyses were performed. Two bands (1 – 0 and 1 – 1) of the comet – tail ($A^2\Pi_i \rightarrow X^2\Sigma^+$) system in the 18900 to 22100 cm^{-1} region were recorded with the Fourier transform spectrometer (BRUKER IFS 125-HR). The absolute accuracy of wavenumbers was about 0.005 cm^{-1} . The measurement cycle included 128 scans within 1.5 h. As a source of the studied spectrum an air-cooled, carbon hollow-cathode (HC) lamp operated at 780 V, 54 mA dc was used. The lamp was filled with a static mixture of $^{17}\text{O}_2$ (70 %) and $^{16}\text{O}_2$ (30 %) at a pressure of ~ 1 Torr. During the discharge process, the O_2 molecules react with the ^{12}C atoms ejected from the carbon filler placed inside the cathode, thus forming $^{12}\text{C}^{17}\text{O}$ and $^{12}\text{C}^{17}\text{O}^+$ molecules in the gas phase, in amounts sufficient to finally achieve a signal-to-noise ratio (SNR) of 100:1 for the $^{12}\text{C}^{17}\text{O}^+$ ion. Spectra were analyzed using a commercial software OPUSTM.², which finds peaks and calculates various spectral parameters (wavenumbers, FWHM, etc). As a result of a detailed spectral analysis the individual molecular constants of both $A^2\Pi_i$ and $X^2\Sigma^+$ states were obtained. For the upper $A^2\Pi_i$ state all these constants were delivered for the first time. The parameters for the lower $X^2\Sigma^+$ state were also calculated and can be compared with these determined previously.^{3,4,5}

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²OPUSTM Computer program by Bruker Optik GmbH; 2014. v.7.5.18.

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