New observations and spectroscopic studies of the fourth – positive $\left(A^1\Pi \rightarrow X^1\Sigma^+\right)$ band system of $^{12}C^{16}O$

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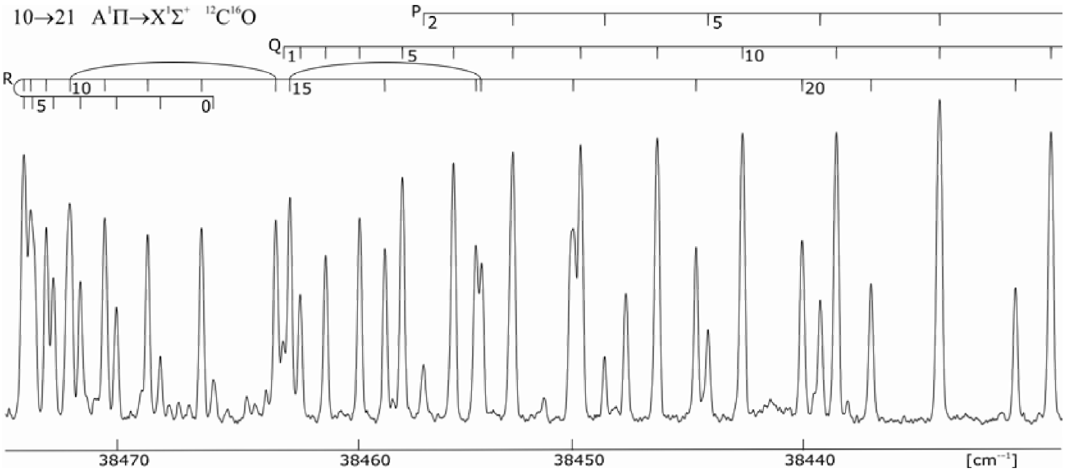
In the spectrum of the $^{12}C^{16}O$ molecule eleven bands of the fourth – positive ($A^1\Pi$-$X^1\Sigma^+$) band system were observed under high resolution by conventional, photographic spectroscopy and studied. The 7-16, 9-19, 10-20, 10-21, 12-22 and 13-24 bands were studied for the first time since Gerö analyses [1,2] under low resolution conducted in 1936. The 7-17, 8-18, 8-19 and 9-20 bands were subjected to first detailed analysis since recordings, which were only mentioned by Schmid and Gerö [3] in the same year. Similarly, the 11-22 band was investigated for the first time since observation of Estey [4] in the thirties of yesterage, who knew only the position of its band head. At the same time due to numerous and extensive perturbation noticeable in all analyzed bands an inter-band vetting of rotational interpretation was accomplished using the Jenkins – McKellar method [5] (p.188). Thanks to new recordings and analyses the information regarding both electronic states of the fourth – positive system got enlarged and organized to significant extent. Amongst all obtained rovibronic parameters, the centrifugal distortion constants D_v of highly excited vibrational v^A=9-13 levels of the $A^1\Pi$ state were calculated for the first time. Up to date they were known solely as the result of theoretical computations of Simmons *et al.* [6] and Field *et al.* [7]. For all studied bands of the fourth – positive system of CO the band origins were also determined. Moreover, the perturbations of seven $A^1\Pi$ v=7-13 vibrational levels were identified and confronted with those predicted from theoretical calculations. Finally, averaged real rotational term values were calculated of the observed vibrational levels of the upper electronic $A^1\Pi$ state of $^{12}C^{16}O$.



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