Perturbation in the $E^1\Pi$ (v = 0) state in the AlH molecule

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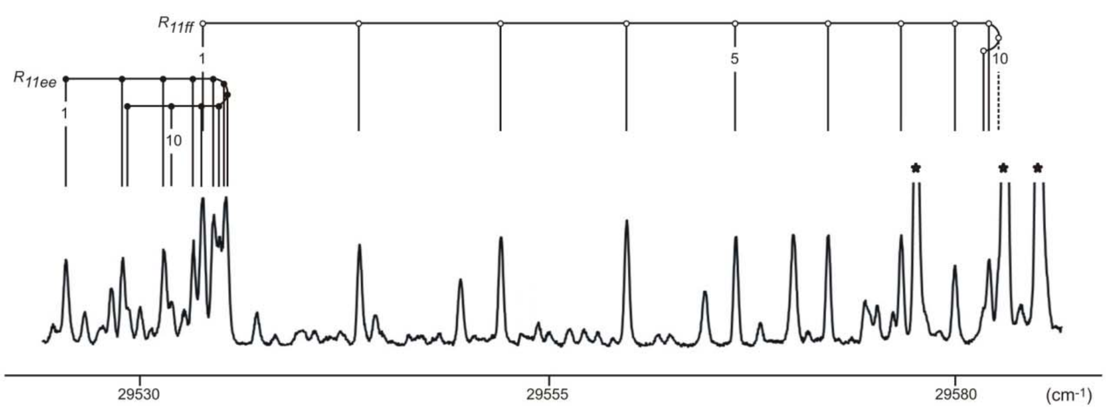
The 0-0 band of the $E^1\Pi$ – $A^1\Pi$ electronic transition of the AlH molecule was reinvestigated in the spectral region of about 29 000 cm^{-1} by using a high accuracy dispersive optical spectroscopy. The AlH molecules were formed and excited in an aluminium hollow-cathode lamp with two anodes, filled with a mixture of Ne buffer gas and a trace of NH_3. The emission from the discharge was observed with a plane grating spectrograph and recorded by a photomultiplier tube. The full rotational structure of the 0-0 band was precisely measured end rotationally analyzed. The new data were elaborated with help of recent $A^1\Pi$ state parameters reported by Szajna et al.[1].

For the $E^1\Pi$, υ = 0 state a considerable irregularities of the Λ-doubling have been observed. The most reasonably explanation for this anomaly is perturbing of the *e* component of the $E^1\Pi$ state by the lying above and unobserved so far $^1\Sigma^+$ state, as it was suggested by Johns [2]. Simultaneously, the *f* component of the E state was observed to be quite regular up to the observed rotational level. For the reason mentioned above the individual band fit was done by means of the least-squares method suggested by Curl and Dane [3] and Watson [4]. In the linear upper $E^1\Pi$, υ = 0 state model the terms values served as the fitted parameters, while the lower state $A^1\Pi$, υ = 0, was represented by the effective Hamiltonian proposed by Brown et al. [5]. In this way precise values of the rotational terms of $E^1\Pi$, υ = 0 state were obtained. Also main rotational constants for the $E^1\Pi$, υ = 0 state were calculated from usual Hamiltonian method [5]: B_0 = 5.300399(17) cm^{-1}, q_0 = -0.64273(12) cm^{-1}, q_{D0} = 1.99890(86) x 10^{-3} cm^{-1} and σ_{0-0} = 29512.1639(18) cm^{-1}, respectively.



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