

High Resolution Vacuum Ultraviolet Emission Spectrum of D₂ from 78 to 103 nm

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Domain : Other

The emission spectrum of the D₂ molecule has been recorded using the high resolution 10m VUV spectrograph in the wavelength range (785 – 1700Å). This instrument is equipped with 3600 lines/mm holographic grating and provide a plate factor of 0.25Å/mm. The spectrum is produced by a Penning electric discharge source and contains about 24 000 lines.

The previous similar experimental study was limited to 1000Å upwards by Bredohl and Herzberg[1] on Lyman and Werner bands.

The analysis of the new spectrum is being carried out with the support of theoretical calculations of term values and line intensities for the $B^1\Sigma_u^+ - X^1\Sigma_g^+$, $C^1\Pi_u - X^1\Sigma_g^+$, $B'^1\Sigma_u^+ - X^1\Sigma_g^+$, $D^1\Pi_u - X^1\Sigma_g^+$ bands taking into account nonadiabatic coupling terms and for the $B''\bar{B}^1\Sigma_u^+ - X^1\Sigma_g^+$, $D^1\Pi_u - X^1\Sigma_g^+$ and $D''^1\Pi_u - X^1\Sigma_g^+$ bands in the adiabatic representation.

Since the large rotational intervals of the small D₂ molecule result in a complex line spectrum similar to a complex atom spectrum, the program suite **IDEN** [2], based on pattern recognition and developed for analysis of complex atomic spectra has been experienced for identifying spectral lines, finding energy levels and optimizing their energy values. The current analyses led to determination of 302 energy levels among which 175 are new.

[1] H. Bredohl and G. Herzberg, Can. J. Phys. **51**, 867 (1973).

[2] V. I. Azarov, Physica Scripta **48**, 656 (1993).