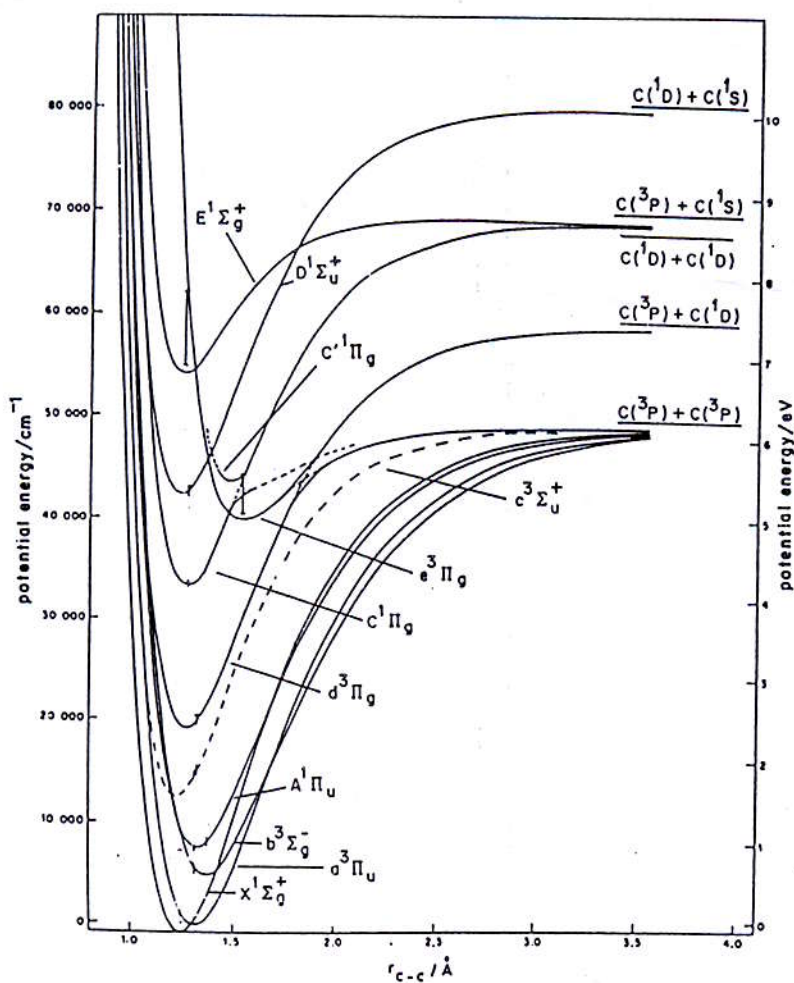


Configurations and states of the C₂ molecule

Configuration	States
1 $(\sigma_g 1s)^2 (\sigma_u^* 1s)^2 (\sigma_g 2s)^2 (\sigma_u^* 2s)^2 (\pi_u 2p)^4$	$X^1 \Sigma_g^+$
2 $(\sigma_g 1s)^2 (\sigma_u^* 1s)^2 (\sigma_g 2s)^2 (\sigma_u^* 2s)^2 (\pi_u 2p)^3 (\sigma_g 2p)^1$	$a^3 \Pi_u, A^1 \Pi_u$
3 $(\sigma_g 1s)^2 (\sigma_u^* 1s)^2 (\sigma_g 2s)^2 (\sigma_u^* 2s)^2 (\pi_u 2p)^2 (\sigma_g 2p)^2$	$b^3 \Sigma_g^-, E^1 \Sigma_g^+, ^1 D_g$
4 $(\sigma_g 1s)^2 (\sigma_u^* 1s)^2 (\sigma_g 2s)^2 (\sigma_u^* 2s)^2 (\pi_u 2p)^4 (\sigma_g 2p)^1$	$c^3 \Sigma_u^+, D^1 \Sigma_u^+$
5 $(\sigma_g 1s)^2 (\sigma_u^* 1s)^2 (\sigma_g 2s)^2 (\sigma_u^* 2s)^2 (\pi_u 2p)^3 (\sigma_g 2p)^2$	$d^3 \Pi_g, C^1 \Pi_g$

Electronic transitions observed in C₂

Transition	Names associated	Spectral region/nm	Source of spectrum
$b^3 \Sigma_g^- \rightarrow a^3 \Pi_u$	Ballik-Ramsay	2700-1100	King furnace
$A^1 \Pi_u \rightleftharpoons X^1 \Sigma_g^+$	Phillips	1549-672	Discharges
$d^3 \Pi_g \rightleftharpoons a^3 \Pi_u$	Swan	785-340	Numerous, including carbon arc
$C^1 \Pi_g \rightarrow A^1 \Pi_u$	Deslandres-d'Azambuja	411-339	Discharges, flames
$e^3 \Pi_g \rightarrow a^3 \Pi_u$	Fox-Herzberg	329-237	Discharges
$D^1 \Sigma_u^+ \rightleftharpoons X^1 \Sigma_g^+$	Mulliken	242-231	Discharges, flames
$E^1 \Sigma_g^+ \rightarrow A^1 \Pi_u$	Freymark	222-207	Discharge in acetylene
$F^3 \Sigma_g^- \leftarrow a^3 \Pi_u$	—	143-137	Flash photolysis of mixture of a hydrocarbon and an inert gas
$g^3 \Delta_g \leftarrow a^3 \Pi_u$	—	140-137	
$F^1 \Pi_u \leftarrow X^1 \Sigma_g^+$	—	135-131	



Potential energy curves for the ground and several excited states of the C₂ molecule

zasada Francka-Condona

w przybliżeniu Born-Oppenheimera

$$\Psi(r, R) = \Psi_n(R) \Psi_e(r, R)$$

$$H_e \Psi_e(r, R) = E_e(R) \Psi_e(r, R)$$

$$[T_n + E_e(R)] \Psi_n(R) = E_n \Psi_n(R)$$

$$R^{kl} = \langle k, v' | \vec{\mu} | l, v'' \rangle$$

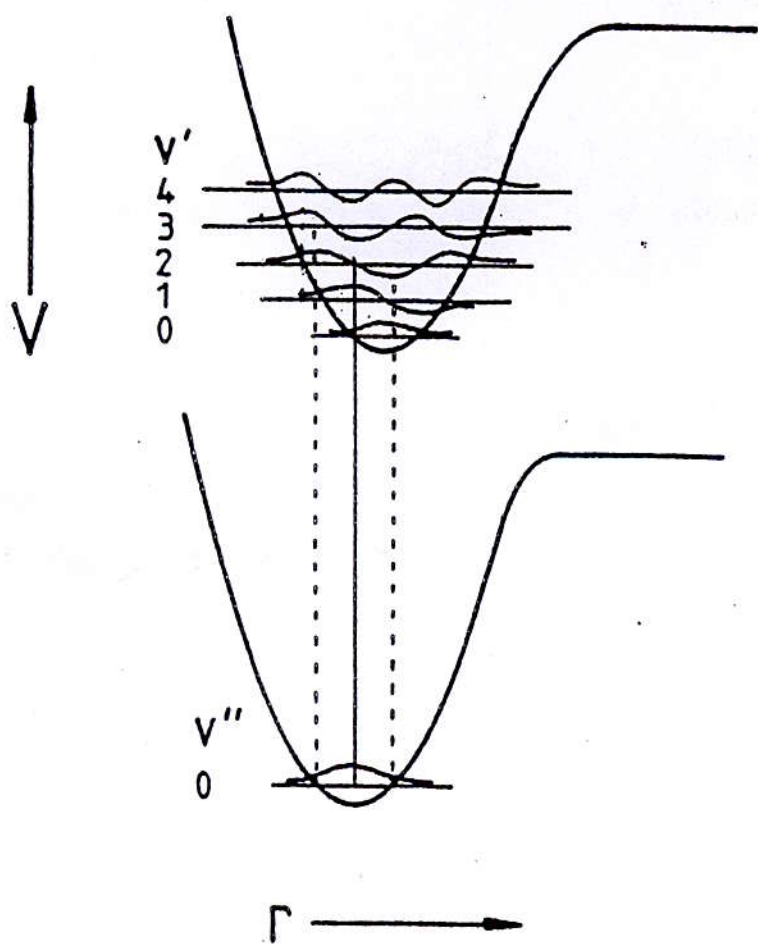
$$\vec{\mu} = \vec{\mu}_e + \vec{\mu}_n$$

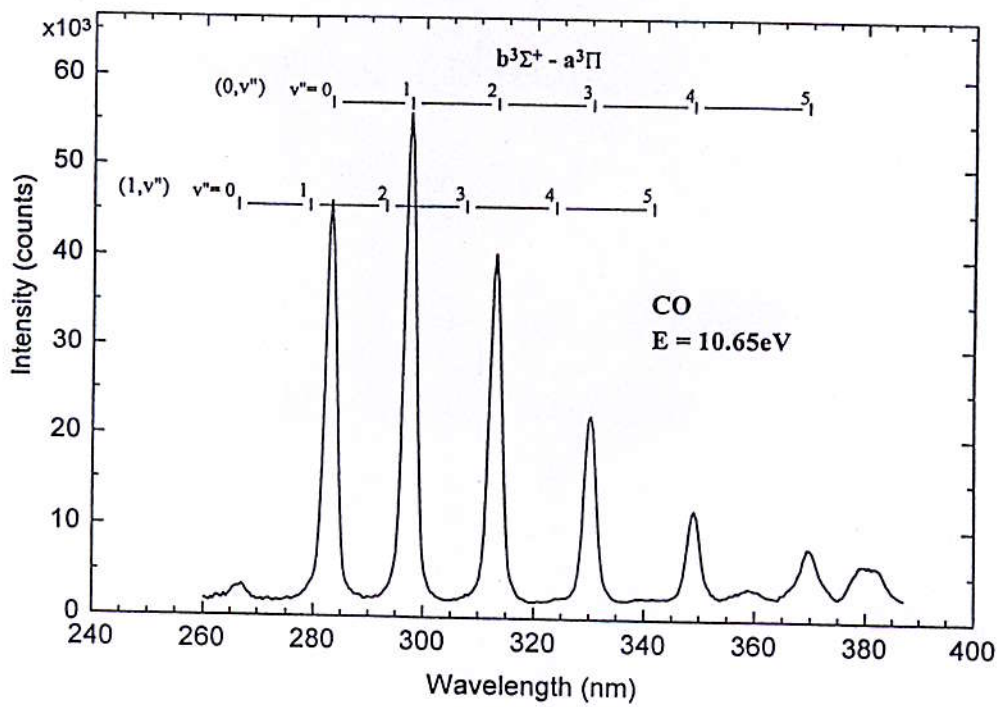
$$R^{kl} = \langle v' | v'' \rangle \langle k | \vec{\mu}_e | l \rangle =$$

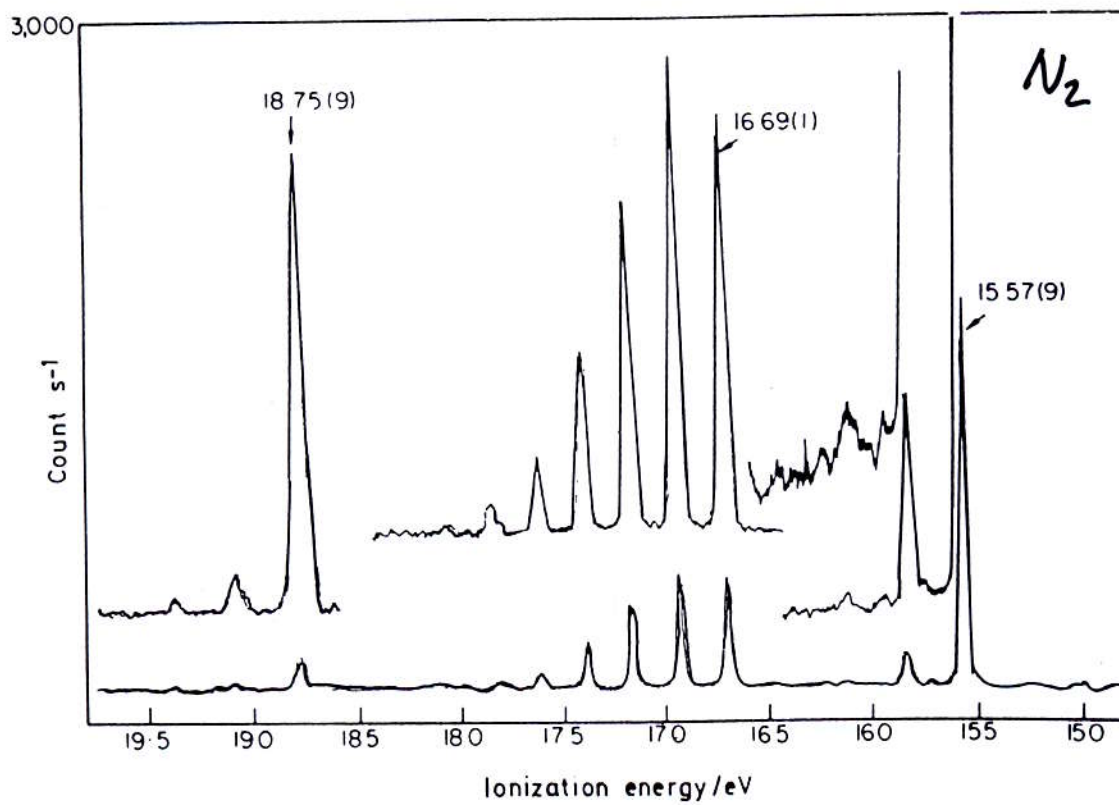
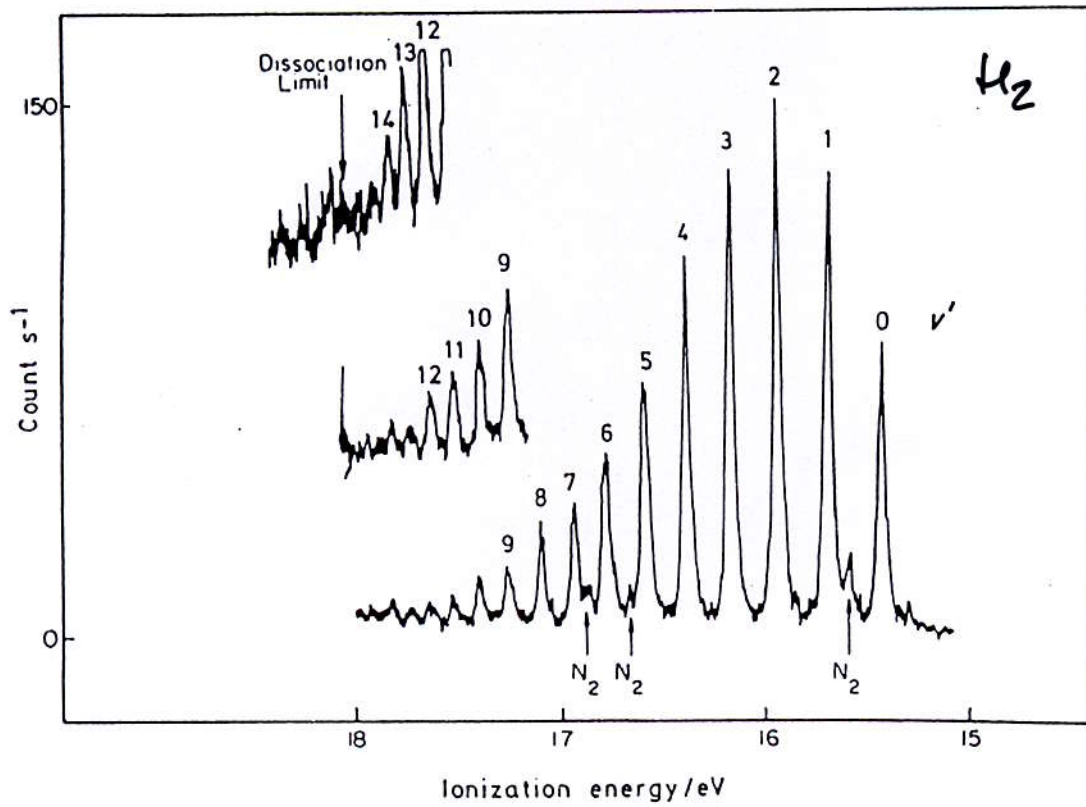
$$= R_e^{kl} \langle v' | v'' \rangle$$

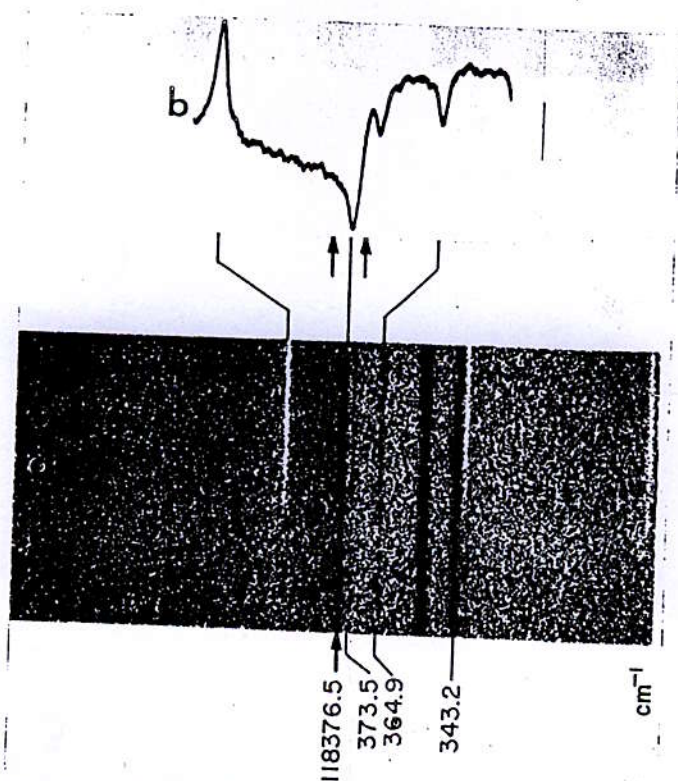
$$q_{v'v''} = [\langle v' | v'' \rangle]^2$$

czynnik F-C









The $J'' = 0$ absorption limit of H_2 , (a), spectrogram; (b), photometer curve. The enlargement of this and all the other spectrograms, with the exception of Fig. 10, is 27 times. The limit is indicated by a vertical arrow in (a); it is between the two arrows in (b).