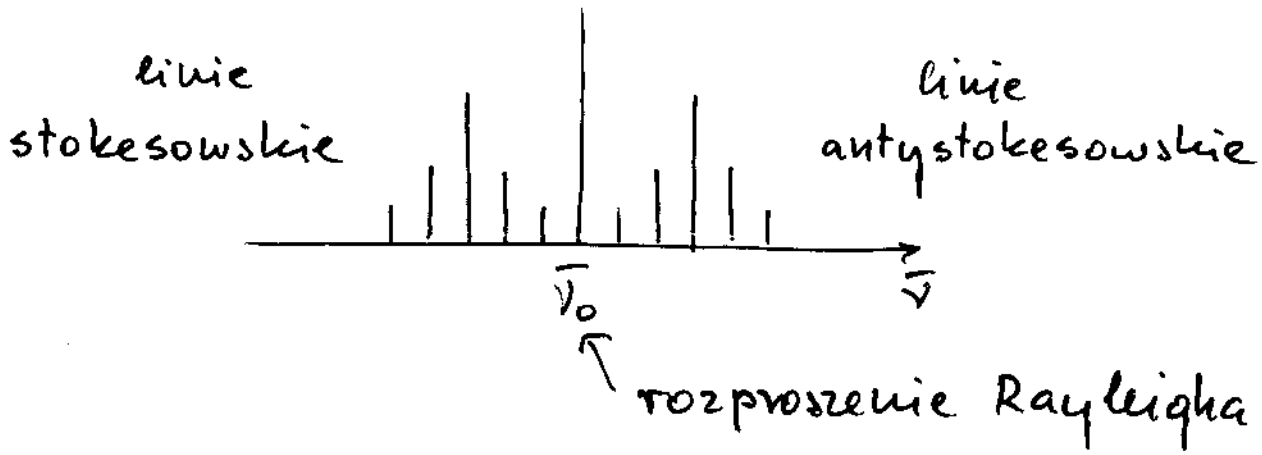
4.6 Spektroskopia Ramana



$$\vec{\mu}_{ind} = \alpha \vec{E}$$

$$E = E_0 \sin 2\pi \nu_0 t$$

$$\alpha = \alpha_0 + \alpha' \sin 2\pi \nu_i t$$

$$\mu_{ind} = \alpha_0 E_0 \sin 2\pi \nu_0 t + \frac{1}{2}\alpha' E_0 \cos 2\pi (\nu_0 \pm \nu_i) t$$

$$\nu_0 \quad , \nu_0 - \nu_i \quad , \nu_0 + \nu_i$$

$$\langle J, M | \mu_{ind} | J', M' \rangle \neq 0$$

$\Delta J = \pm 2$ drobiny liniowe

drobiny dwuatomowe

$\bar{\nu} < \bar{\nu}_0$ $\quad J \to J+2$

$\Delta \bar{\nu} = -2B_0(2J+3)$ $\quad v=0$

$\bar{\nu} > \bar{\nu}_0$ $\quad J \to J-2$

$\Delta \bar{\nu} = 2B_0(2J+3)$ $\quad v=0$

$B_0 \cong 0.3\ cm^{-1}\ (v=0) \qquad 4B \simeq 1.2\ cm^{-1}$

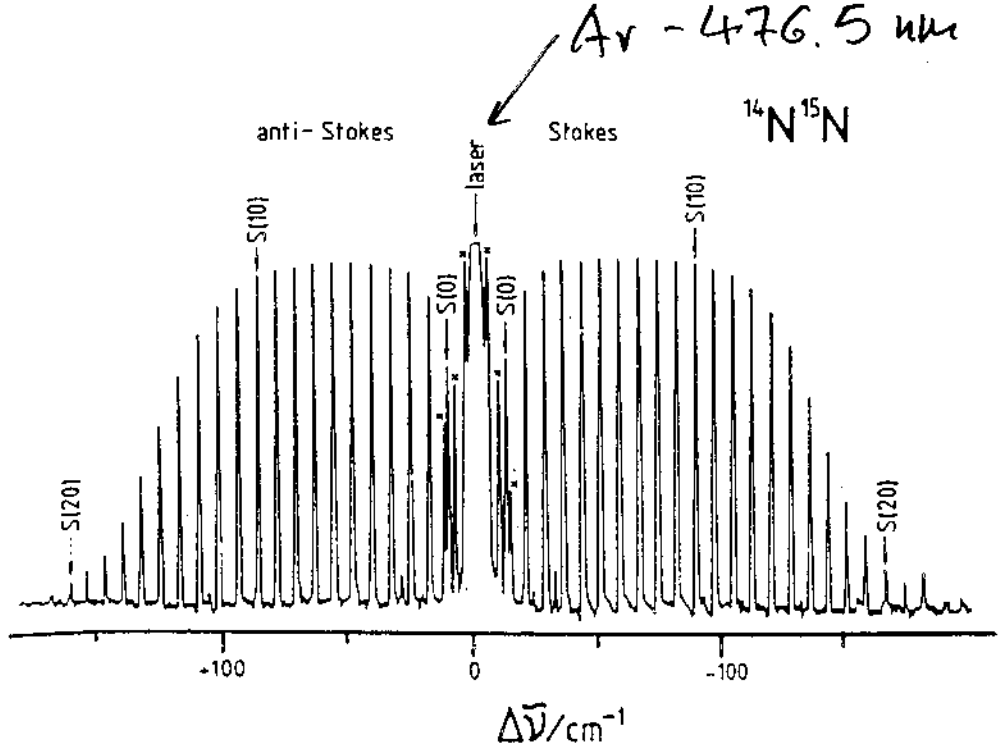
$$|\Delta\nu| = (2B_0 - 3D_0)(2J+3) - D_0(2J+3)^3$$

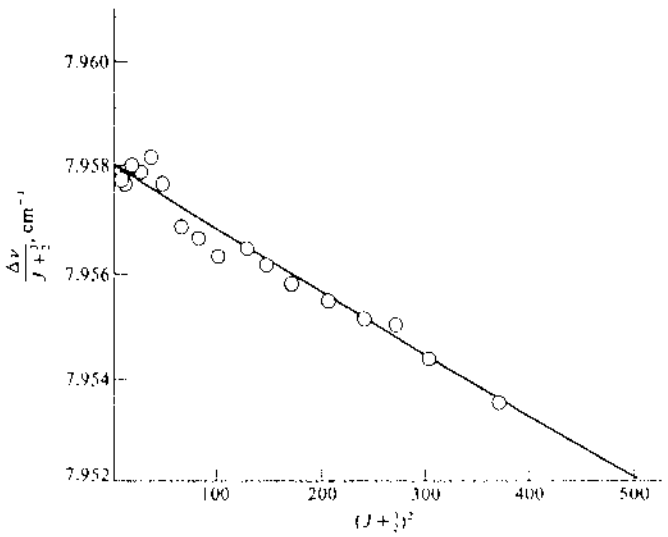
$$\frac{\Delta\tilde{\nu}}{2J+3} = (2B_0 - 3D_0) - D_0(2J+3)^2$$

$B_0 = 1.989506 \pm 0.000027\ cm^{-1}$

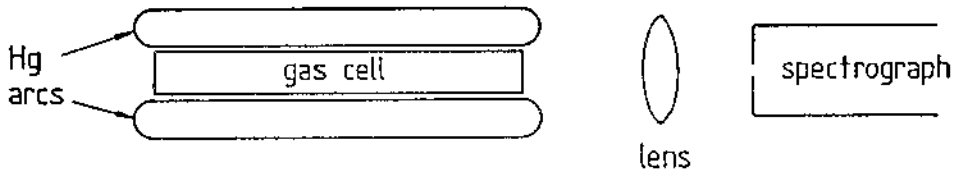
$D_0 = (5.48 \pm 0.06)\,10^{-6}\ cm^{-1}$

$r_0 = 0.110010 \pm 0.000001\ nm$





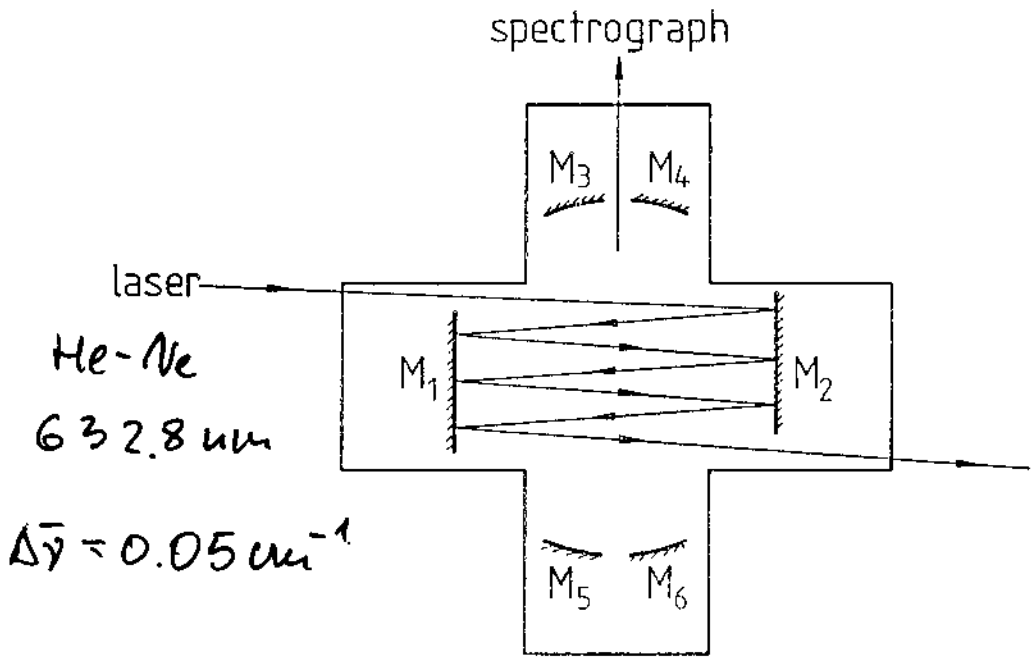
Plot of Raman data for N_2.



Experimental arrangement for obtaining the Raman spectrum of a gas using Toronto mercury arcs

253.7 nm, 404.7 nm, 435.7 nm

$\Delta\bar{\nu} = 0.2\,cm^{-1}$

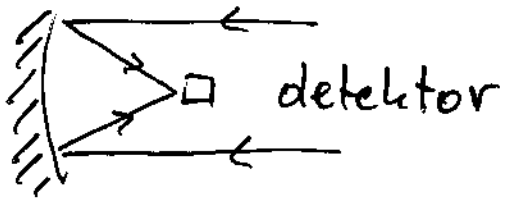


$\Delta\bar{\nu} = 0.05\,cm^{-1}$

Multiple reflection sample cell for passing the laser beam through the gas many times (using mirrors M_1 and M_2) and for efficient collection of the scattered radiation (using mirrors M_3, M_4, M_5 and M_6)

podczerwień – Nd^{3+} : YAG – 1064 nm

4.7. Badania struktury cząsteczek



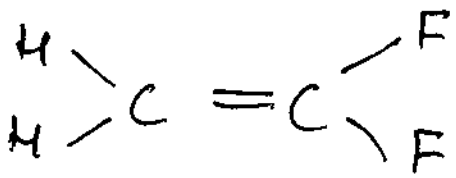
OH – $\lambda = 18\,cm$

NH_3 – $\lambda = 1.25\,cm$ 1968

C_2H , HCO^+ , N_2H^+

CS , SO , NS

$C_2H_2F_2$



$r_e(CC)$, $r_e(CH)$, $r_e(CF)$

$\sphericalangle HCH$, $\sphericalangle FCF$

A_e , B_e , C_e

$\Downarrow$

$F_2{}^{12}C={}^{12}C\,H_2$, $F_2{}^{12}C={}^{12}C\,{}^{2}H_2$

$F_2{}^{13}C={}^{12}C\,H_2$

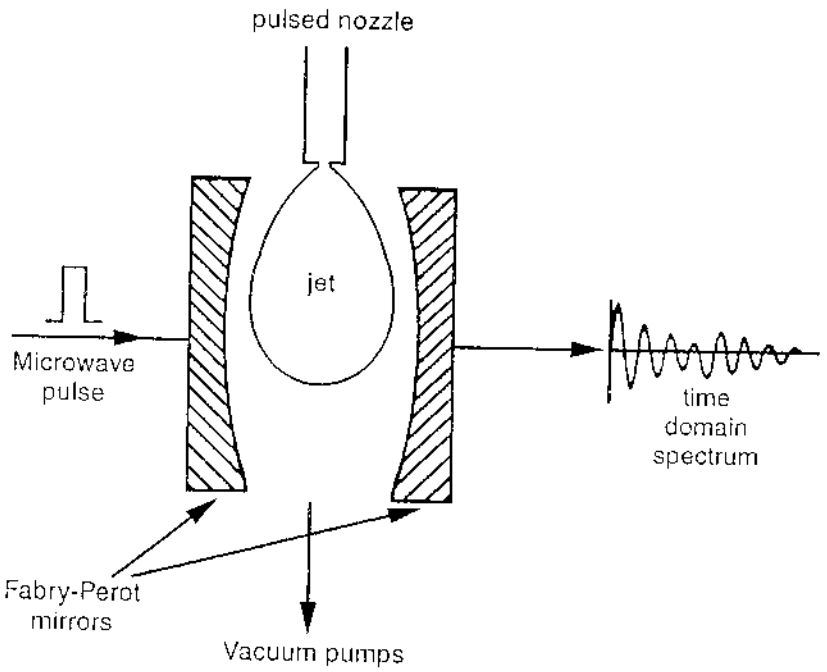
NF_3

$r_e(NF) = 1.365 \pm 0.002$ Å

$r_0(NF) = 1.371 \pm 0.002$ Å

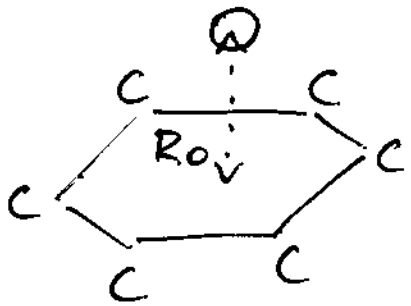
$\sphericalangle_e FNF = 102.37 \pm 0.03°$

$\sphericalangle_0 FNF = 102.17 \pm 0.03°$



The supersonic jet in a pulsed nozzle Fourier transform microwave spectrometer

– słabozwiązane cząsteczki



Ne – 3.46 Å

Xe – 3.83 Å