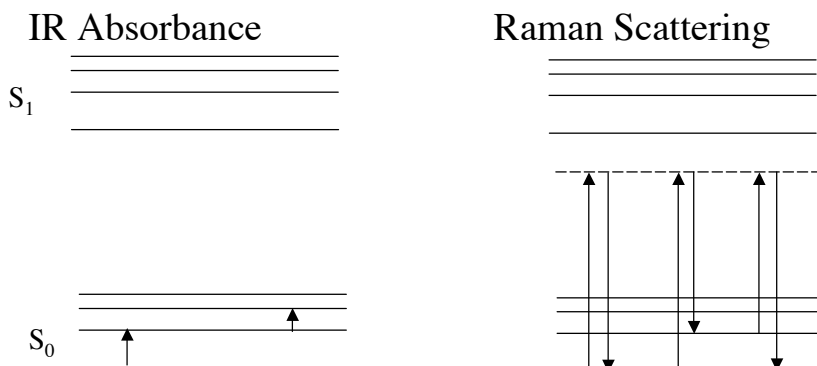


Vibrational Spectroscopy

Principles of VS -

Nearly all molecules absorb IR radiation. Vibrational spectra usually used for qualitative analysis. Quantitation is possible, but often difficult.

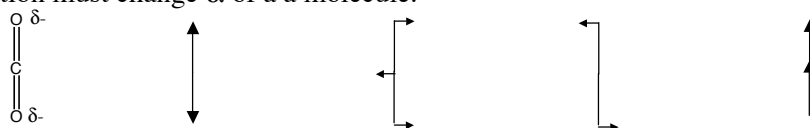


Vibrational Spectroscopy

Each atom in a molecule can move in 3 directions, so

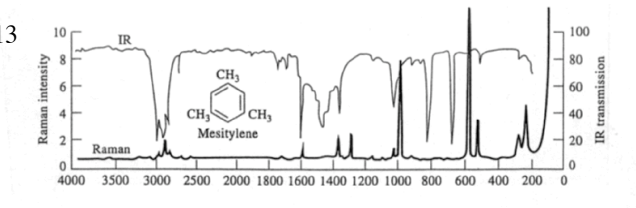
To absorb IR $h\nu$, a vibration must change μ of molecule.

To inelastically scatter VIS/NIR photons, a vibration must change α of a molecule.



IR vs Raman

Cf I&C, Fig 16-13
Pg 509



Mid IR
region

2.5 μm - 10 μm - group freq. region*
e.g,

8 μm - 25 μm - fingerprint region (whole molecule vib.)

IR Advantages

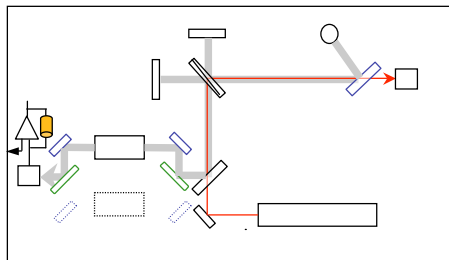
1.

Raman Advantages

1.

FTIR Spectrometer

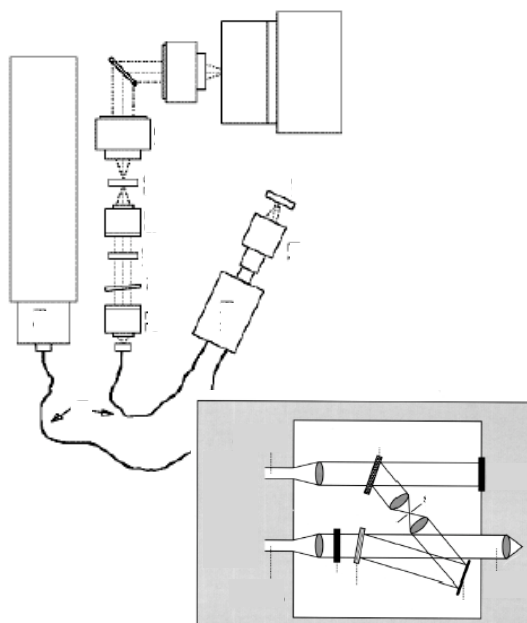
Double-beam FTIR spectrometer
(compensates for source and detector drift)



blue mirrors are toroidal, green rotate

Raman Spectrometer

Dispersive Raman Spectrometer

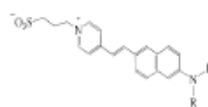


Paper 3: Vibrational Spec.

Campagnola, P. J., Wei, M. D., Lewis, A., Loew, L. M., High-resolution nonlinear optical imaging of live cells by second harmonic generation. *Biophys. J.* **1999**, 77(6), 3341-3349.

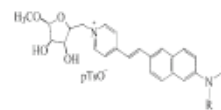
Objectives

Approach



a) $R = (CH_2)_9CH_3$

c) $R = (CH_2)_7CH_3$

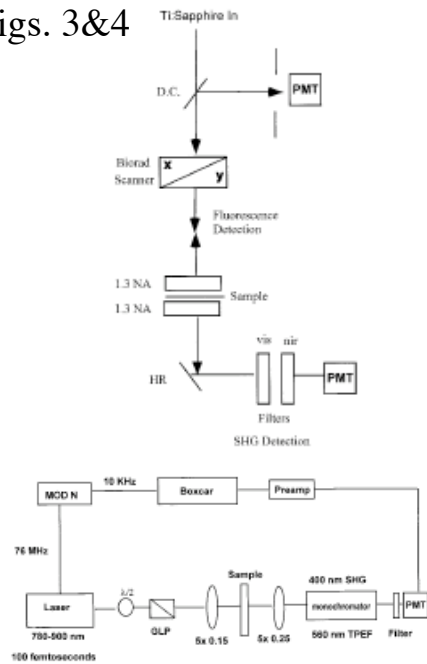


b) $R = (CH_2)_9CH_3$

d) $R = (CH_2)_7CH_3$

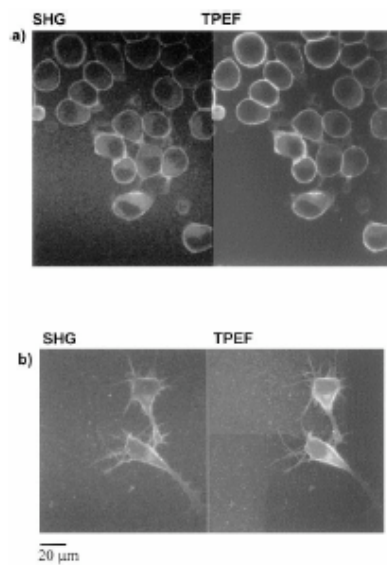
Instrumentation

Figs. 3&4



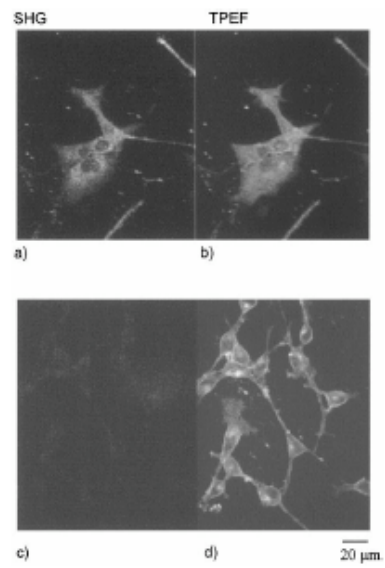
Results

Fig. 5



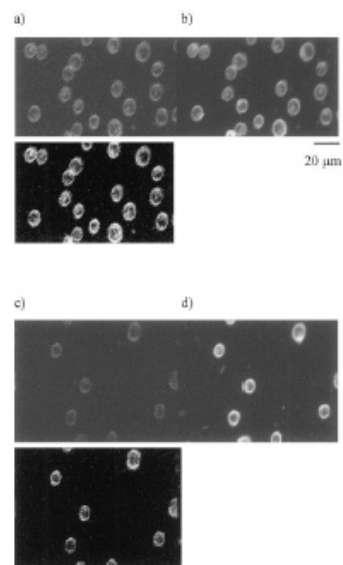
Results

Fig. 6



Results

Fig. 7



Conclusions

Authors Conclusions

Critique