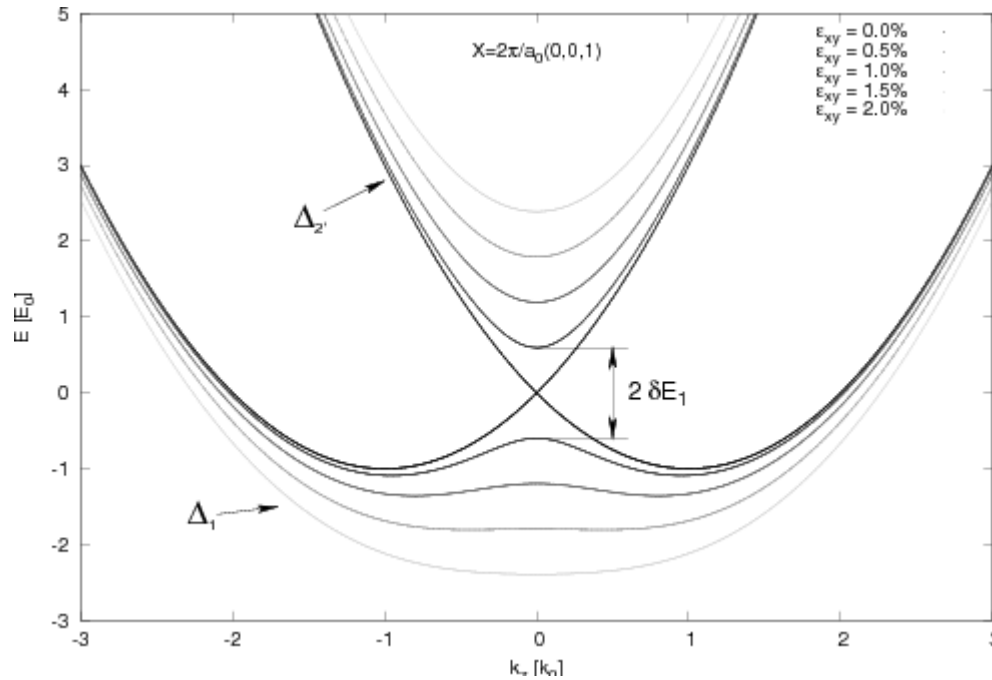


Shear strain splitting

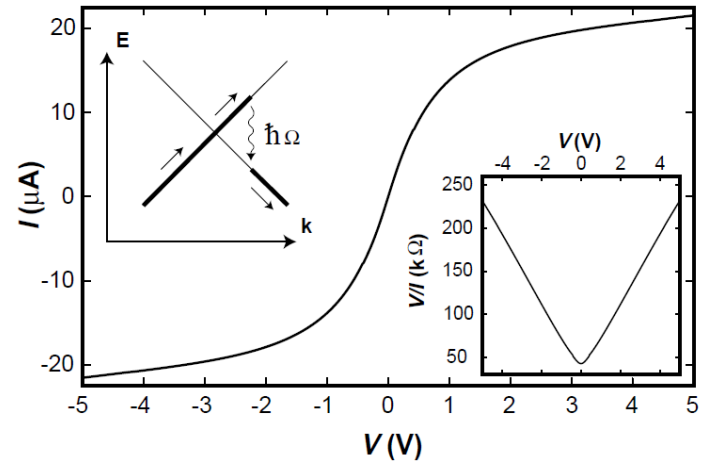
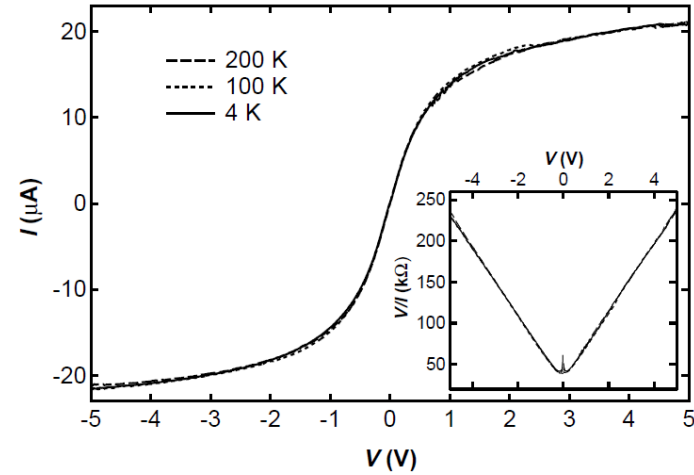
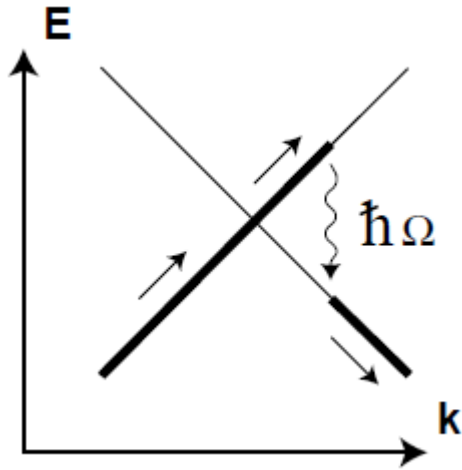
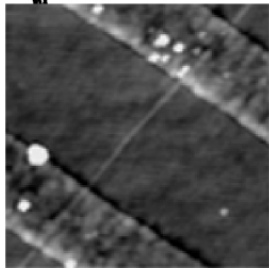


Typical valence bands of tetrahedral semiconductors, shear strain along (110)
Note how effective mass changes

Types of e-ph interaction

Phonon	Si		GaAs	
	Conduction	Valence	Conduction	Valence
TA	DP (Ξ_u)	DP (b, d)	PZ	DP (b, d), PZ
LA	DP (Ξ_d, Ξ_u)	DP (a_v, b, d)	DP (a_c), PZ	DP (a_v, b, d), PZ
TO		DP (d_0)		DP (d_0)
LO		DP (d_0)	Fröhlich	DP (d_0), Fröhlich

E-ph coupling in CNTs

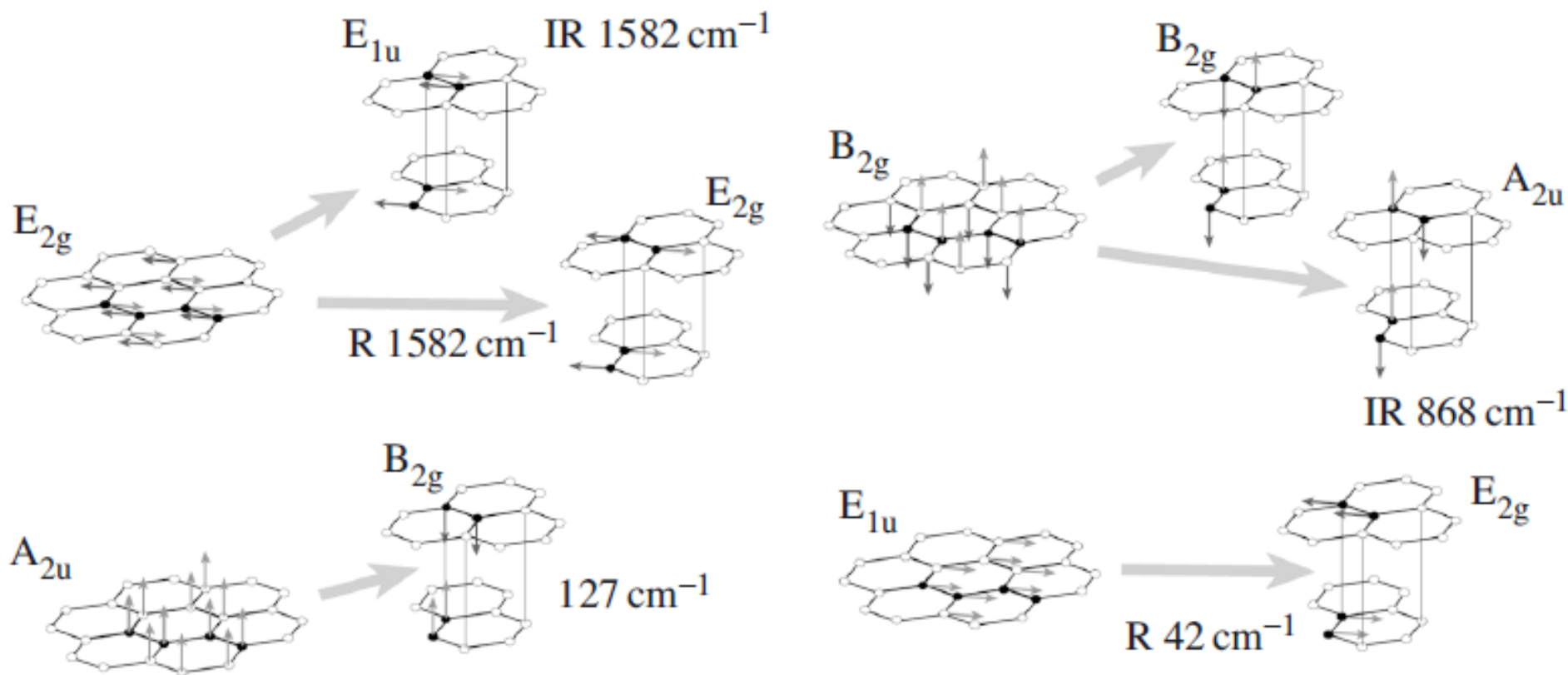


Character table for D_{6h} point group

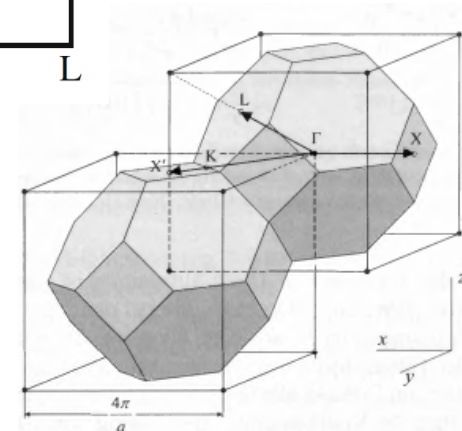
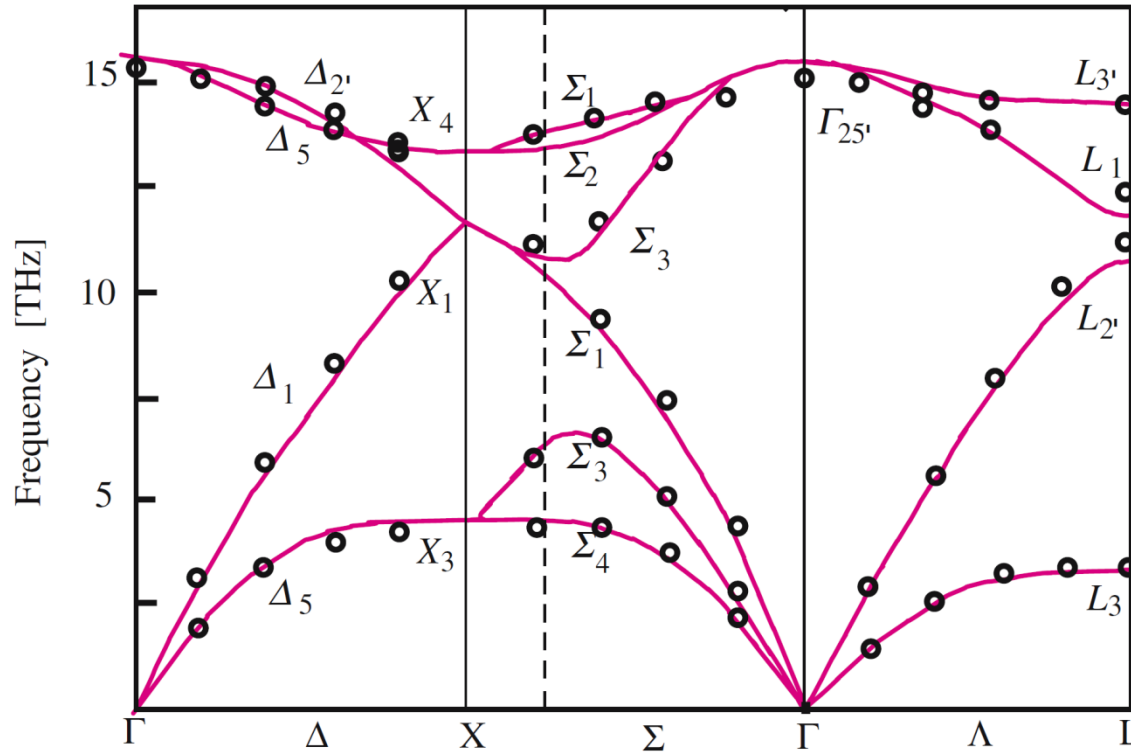
	E	$2C_6$	$2C_3$	C_2	$3C'_2$	$3C''_2$	i	$2S_3$	$2S_6$	σ_h	$3\sigma_d$	$3\sigma_v$	Linear, rotations	Quadratic
A_{1g}	1	1	1	1	1	1	1	1	1	1	1	1		x^2+y^2, z^2
A_{2g}	1	1	1	1	-1	-1	1	1	1	1	-1	-1	R_z	
B_{1g}	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1		
B_{2g}	1	-1	1	-1	-1	1	1	-1	1	-1	-1	1		
E_{1g}	2	1	-1	-2	0	0	2	1	-1	-2	0	0	(R_x, R_y)	(xz, yz)
E_{2g}	2	-1	-1	2	0	0	2	-1	-1	2	0	0		(x^2-y^2, xy)
A_{1u}	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1		
A_{2u}	1	1	1	1	-1	-1	-1	-1	-1	-1	1	1	z	
B_{1u}	1	-1	1	-1	1	-1	-1	1	-1	1	-1	1		
B_{2u}	1	-1	1	-1	-1	1	-1	1	-1	1	1	-1		
E_{1u}	2	1	-1	-2	0	0	-2	-1	1	2	0	0	(x, y)	
E_{2u}	2	-1	-1	2	0	0	-2	1	1	-2	0	0		

ment.

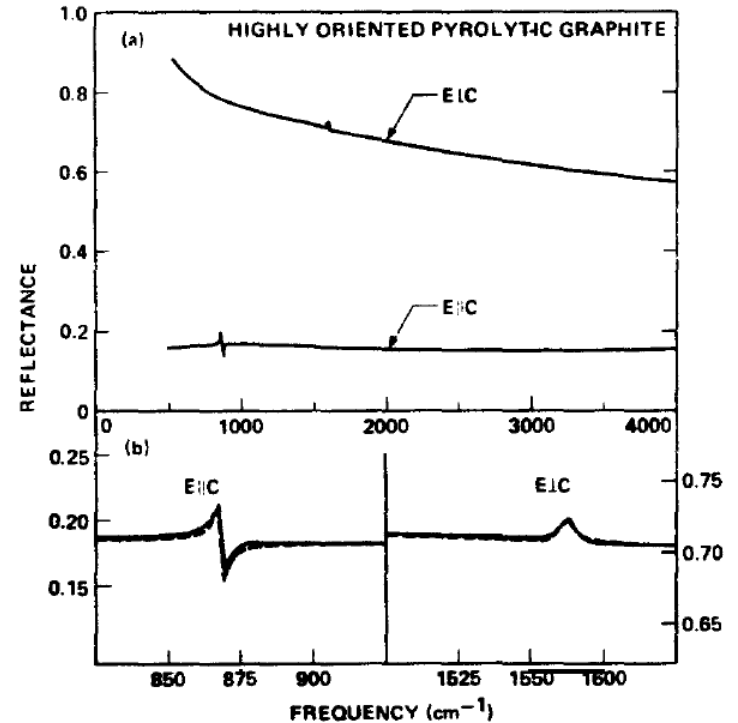
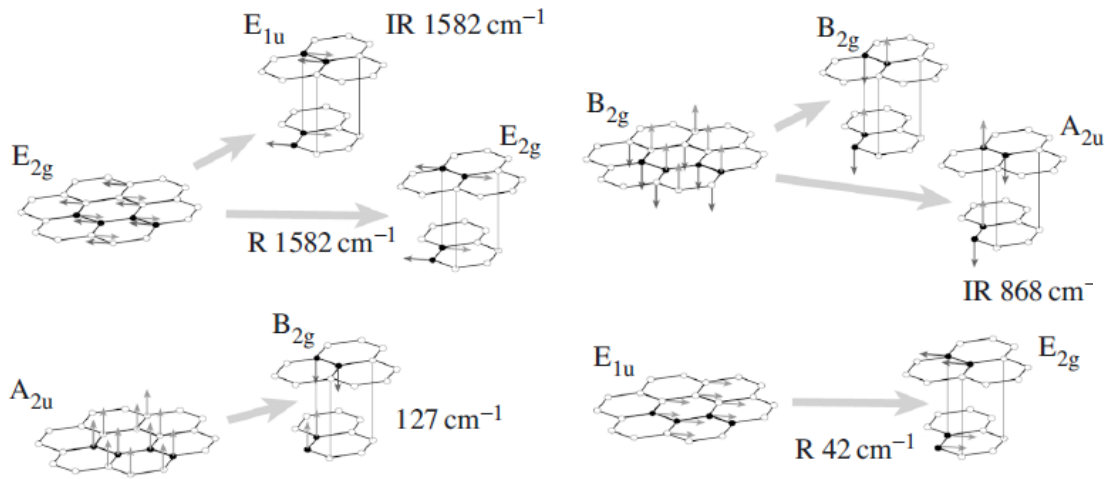
Vibrations of graphite



Phonon dispersion Si

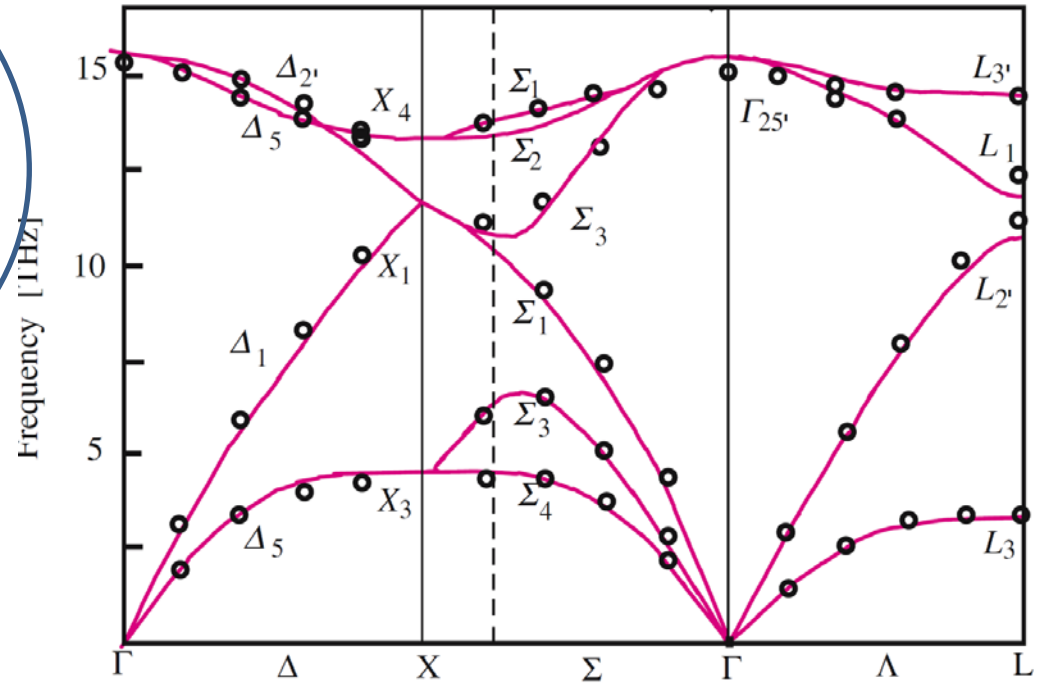
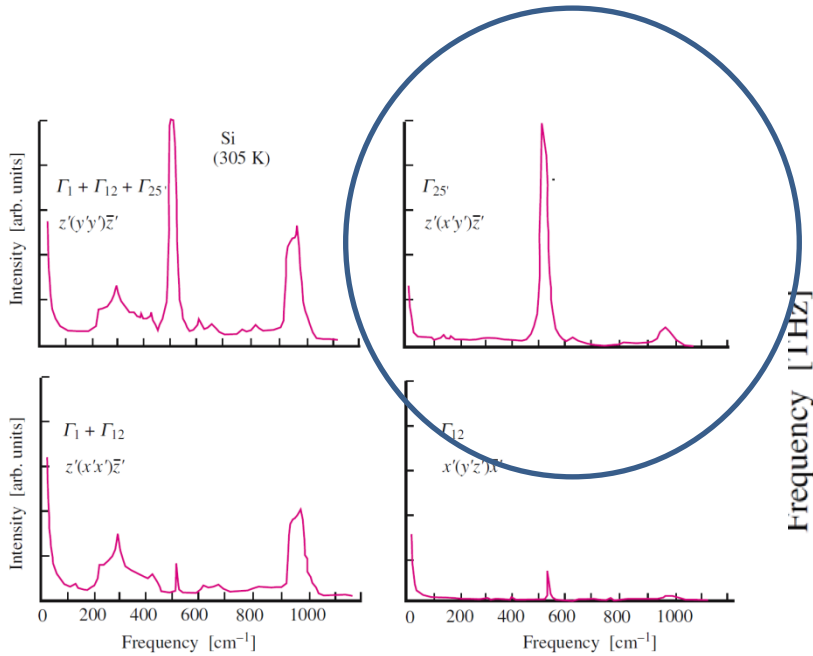


Vibrations of graphite

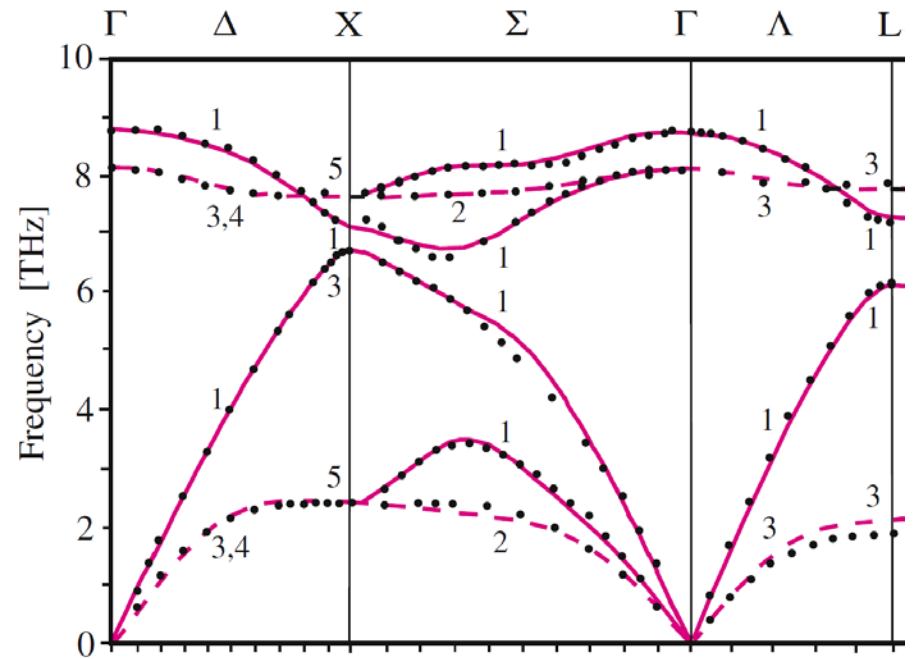
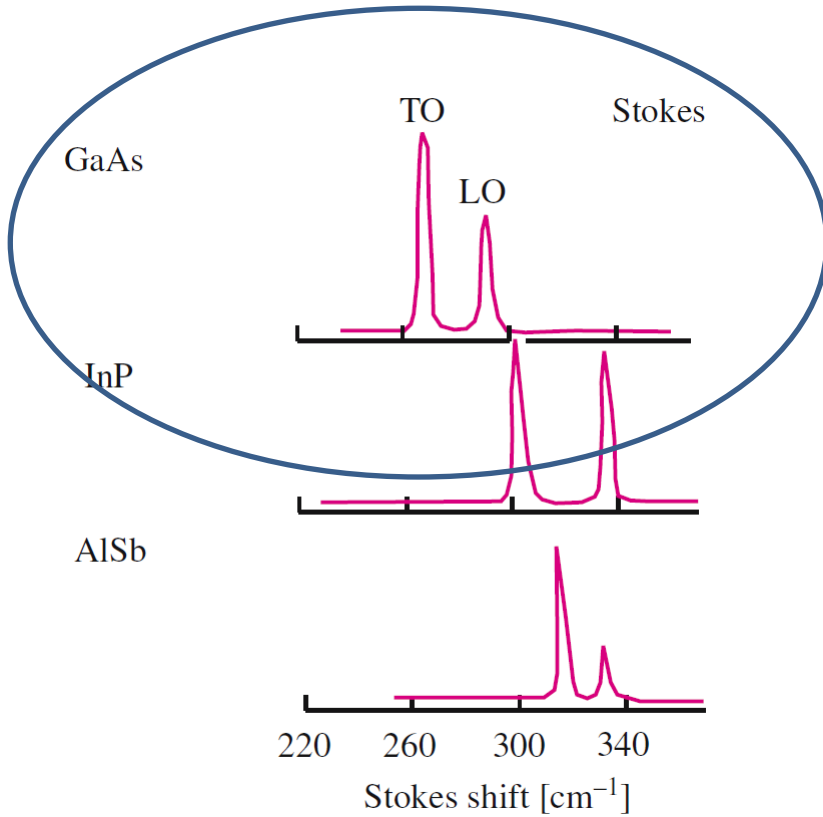


Reich & Thomsen (2007); Nemanich, Sol. State Commun. (1977)

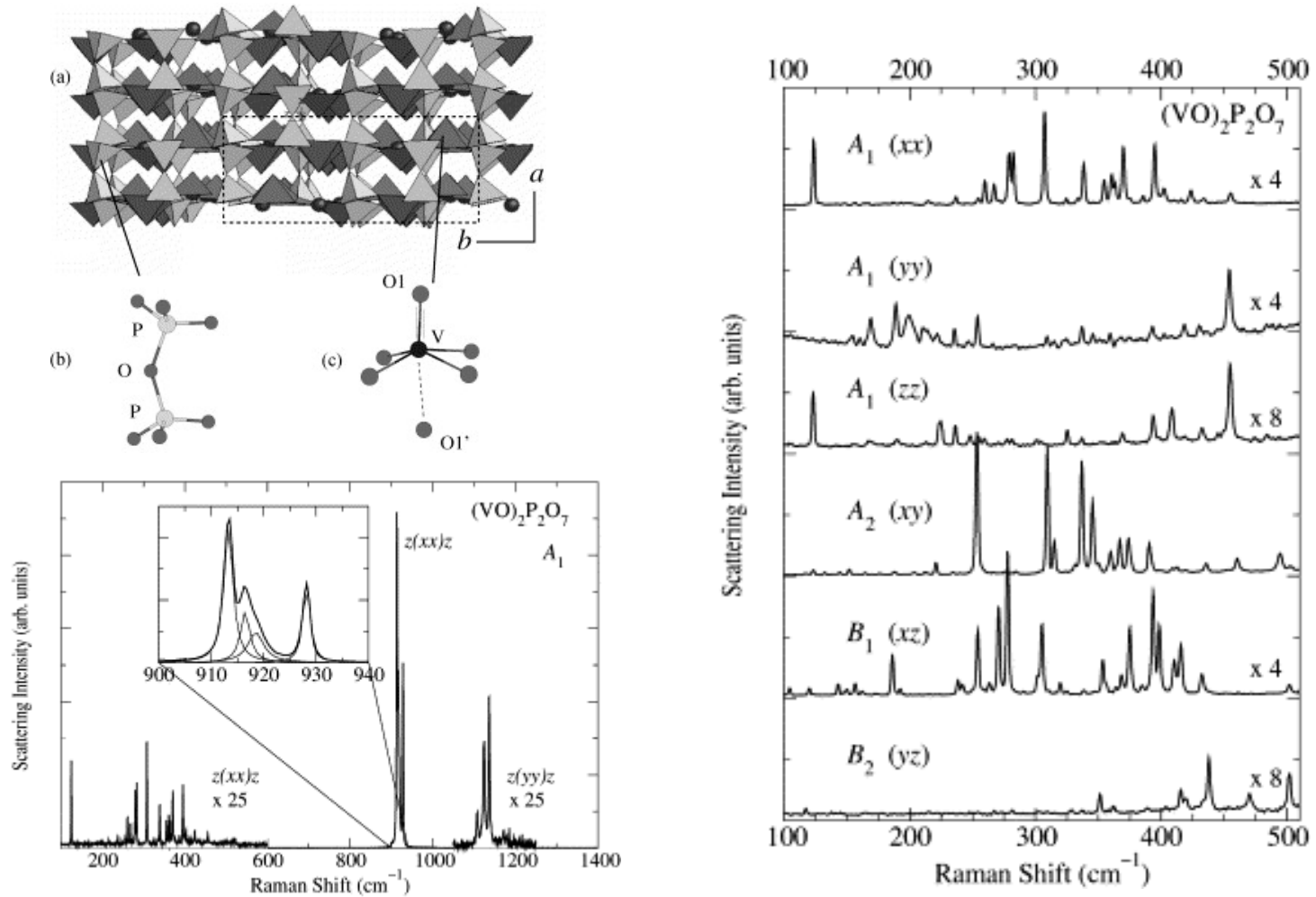
Phonon dispersion Si



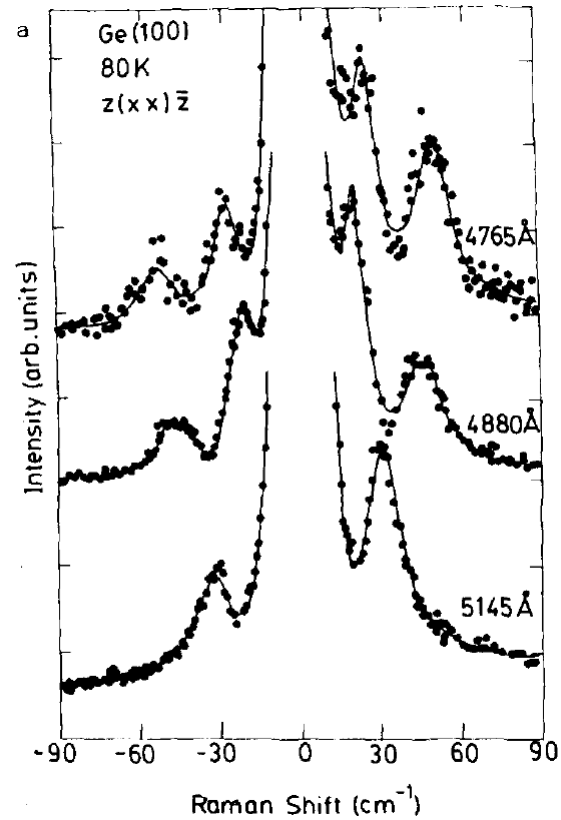
Phonon dispersion GaAs



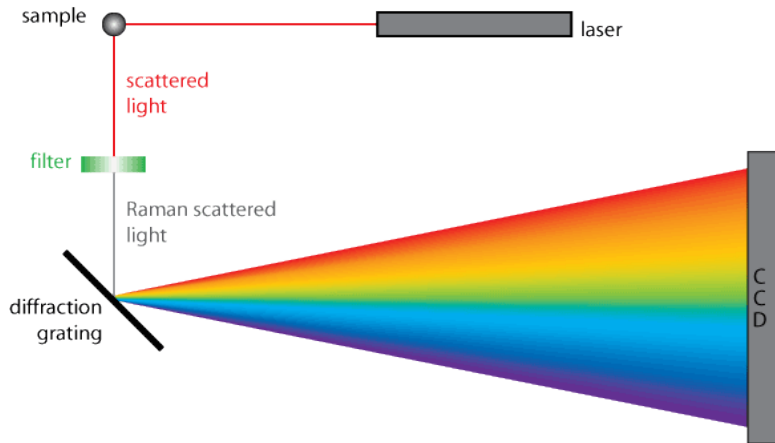
VOPO - Vanadyl pyrophosphate



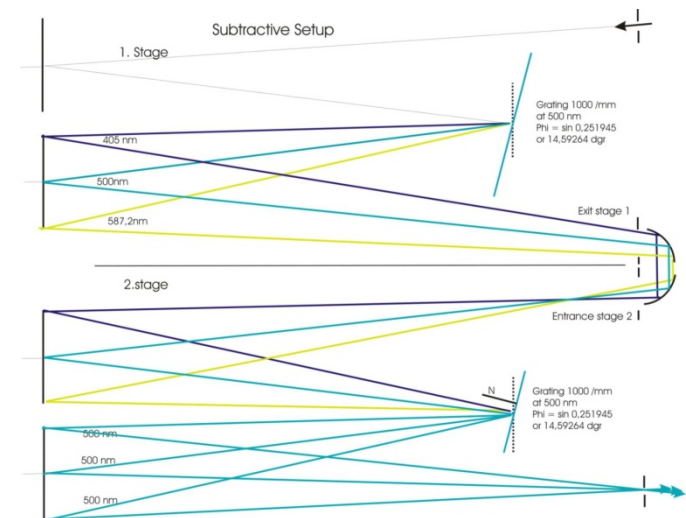
Acoustic phonons of Ge



Raman spectrometers



Filter:
high-precision dielectric mirror
(notch filter)
double-grating spectrometer



Photonic crystal

- Band structure for photons from translational symmetry

