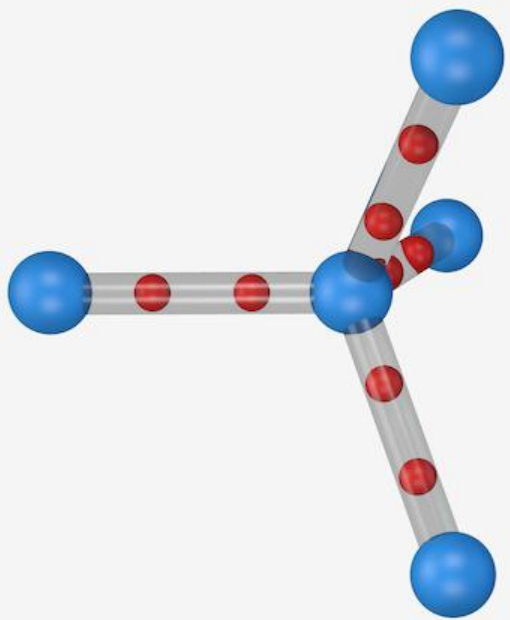


Working Principle of a Semiconductor Based Solar Cell

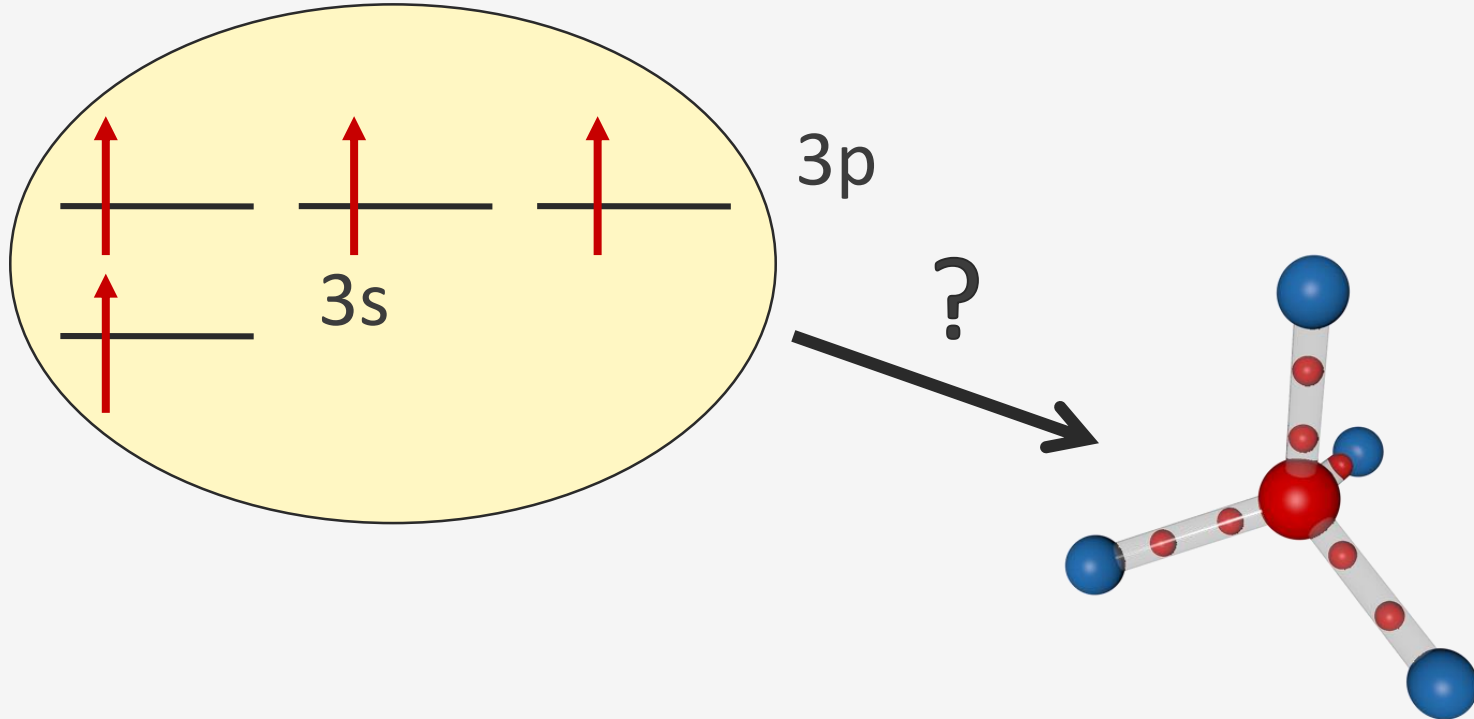
Band Gap II - Electrons in Molecular Bonds

Week 2.2.2

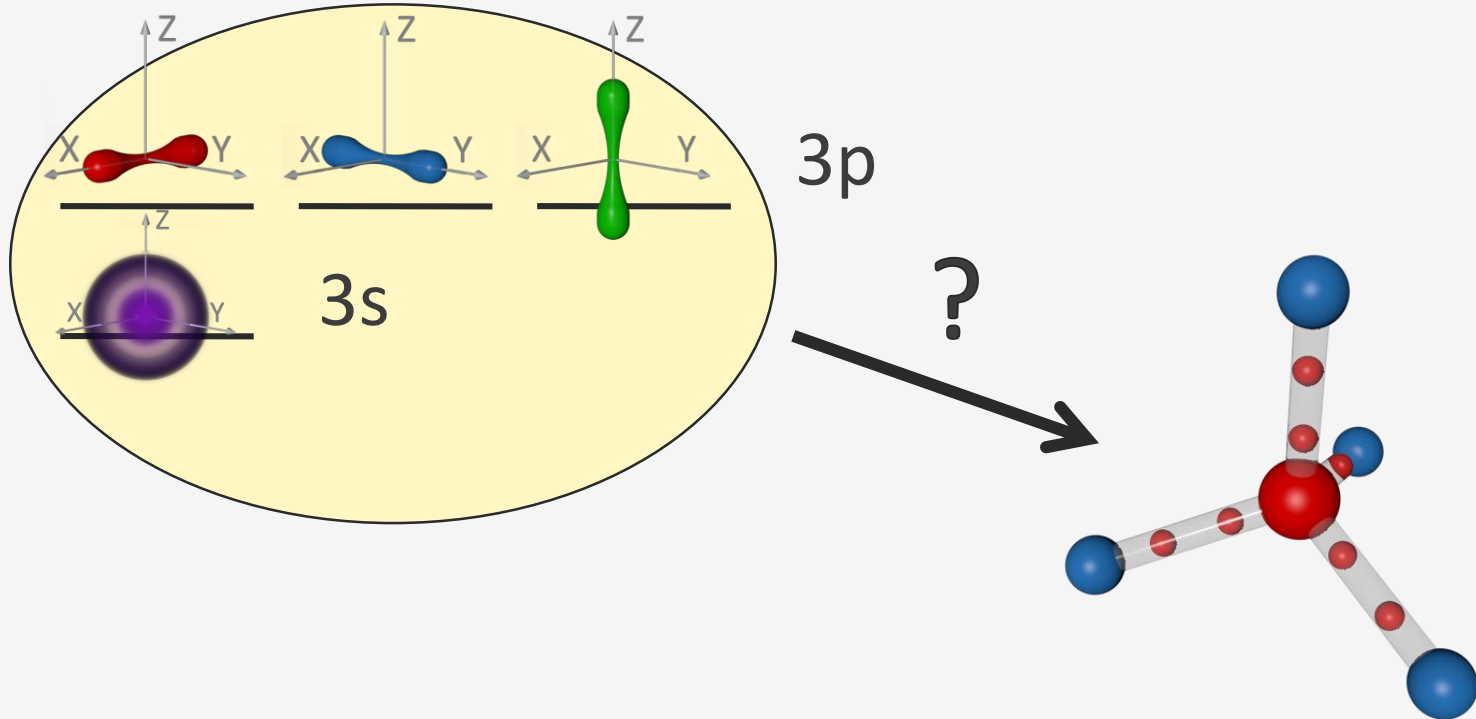
Arno Smets

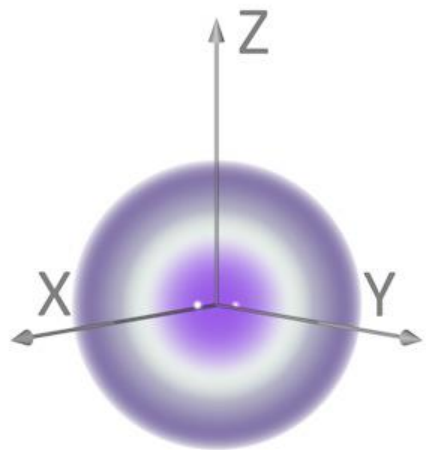


Bonding of electrons in Si network

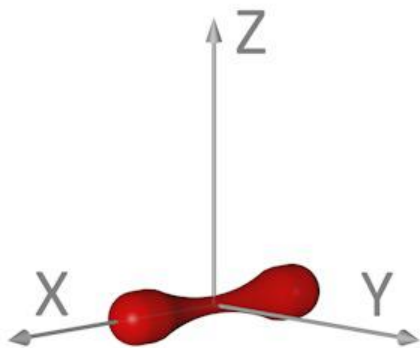


Bonding of electrons in Si network

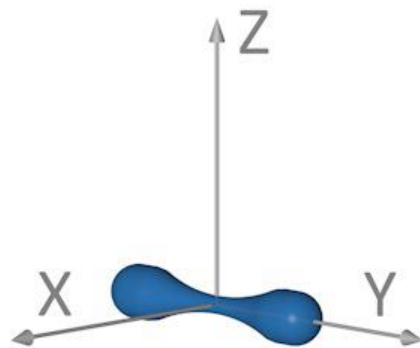




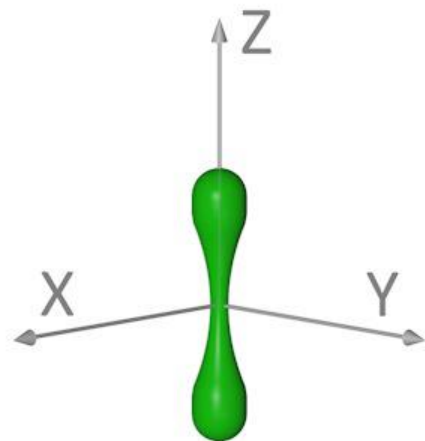
S



P_X

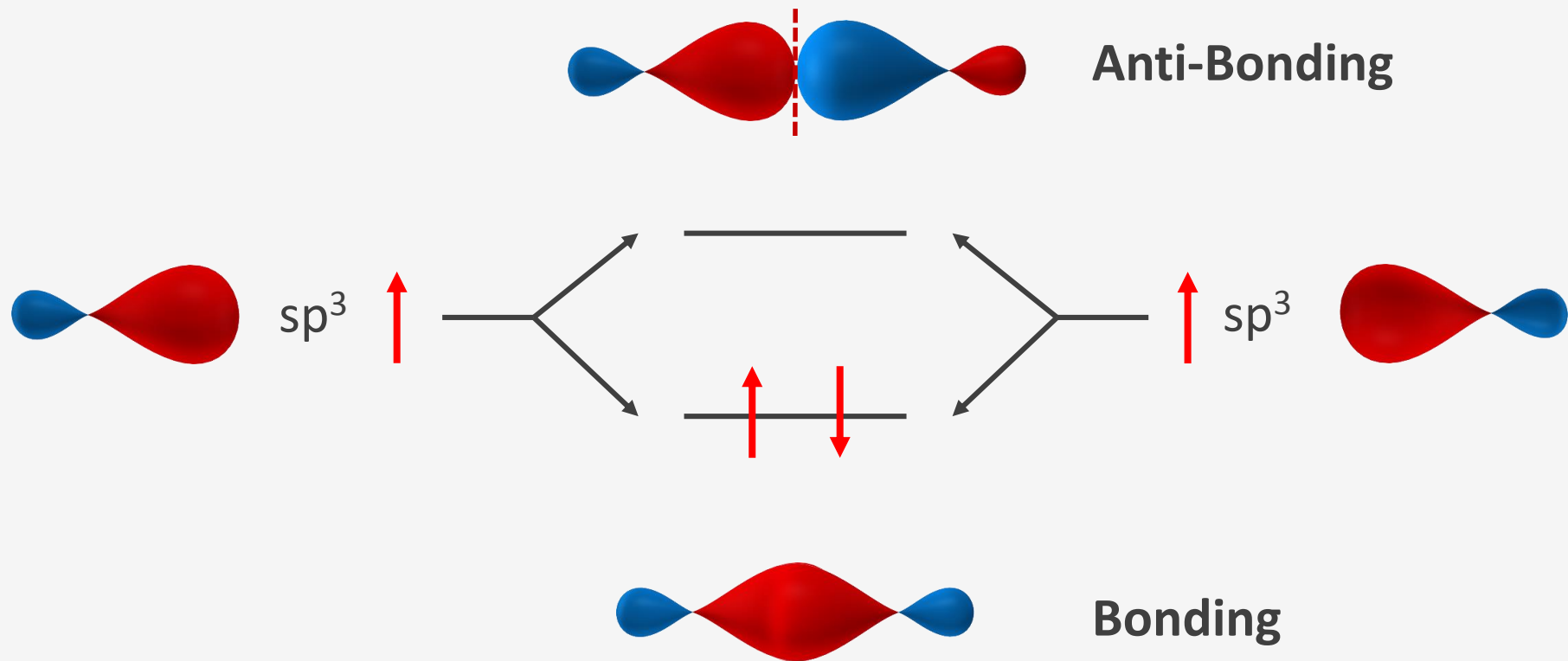


P_Y

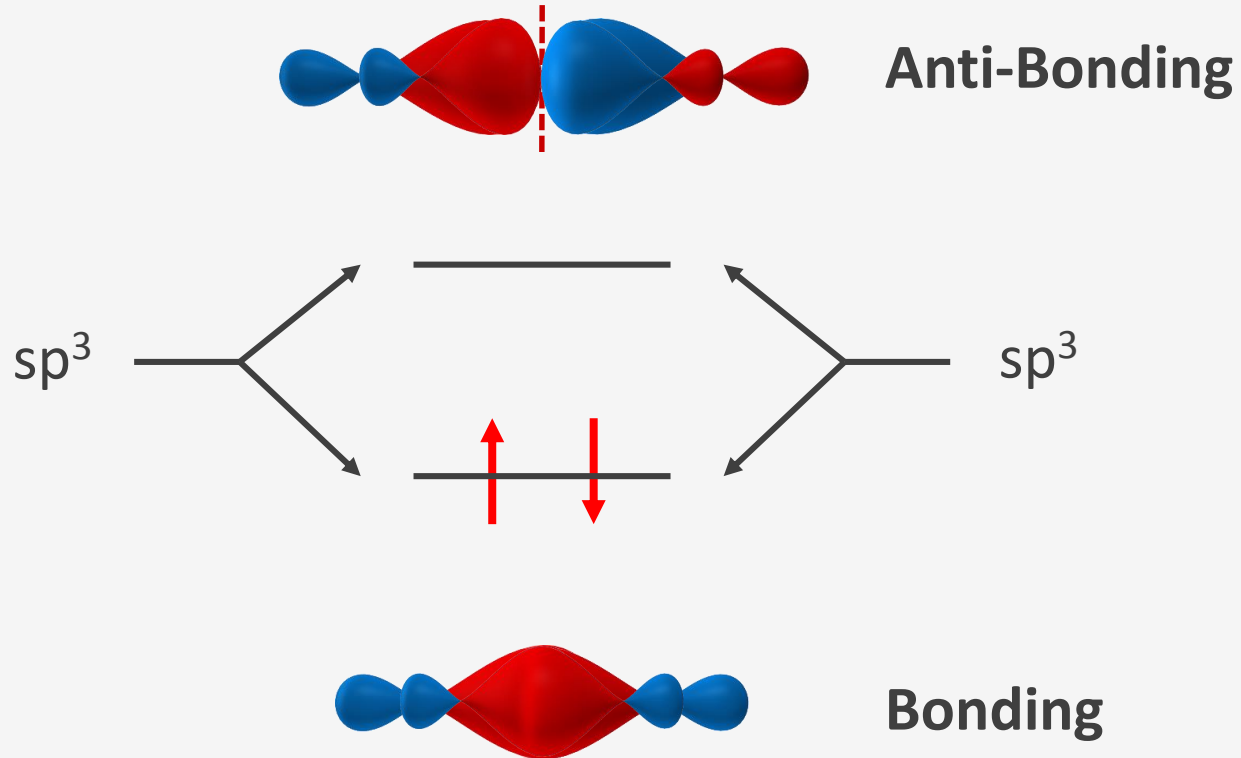


P_Z

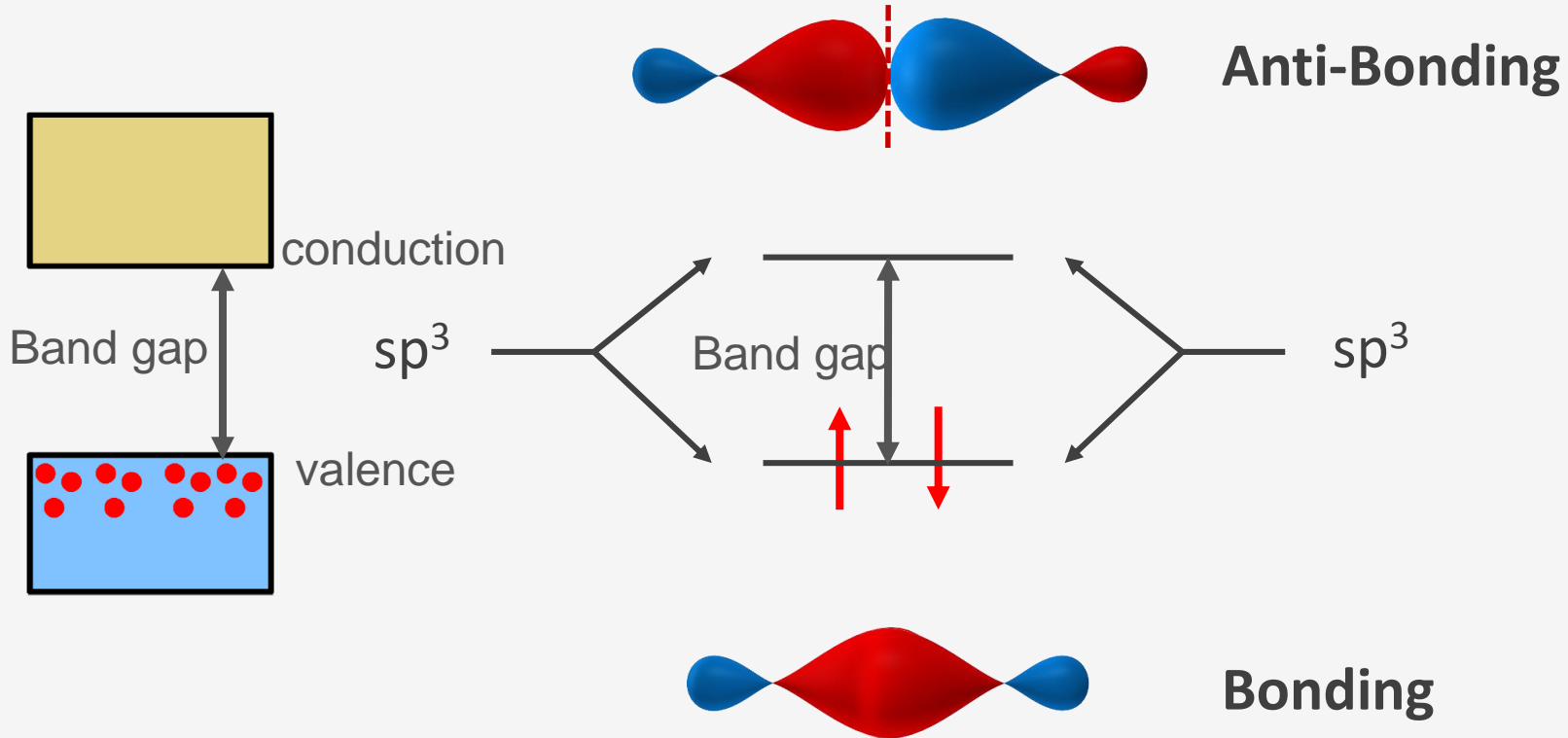
Molecular description of band gap



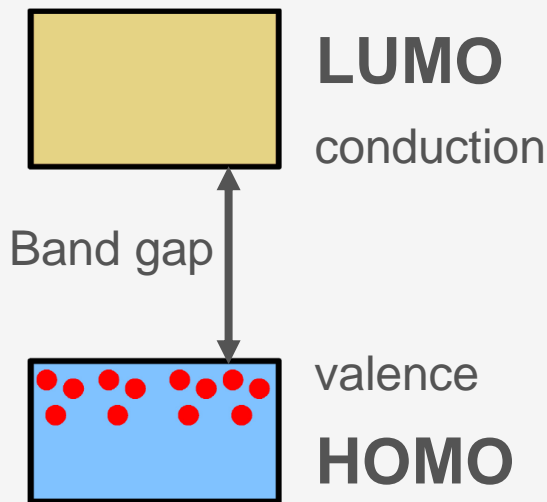
Molecular description of band gap



Molecular description of band gap



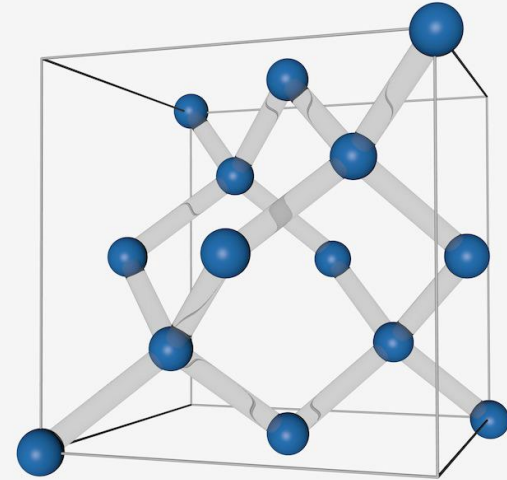
Molecular description of band gap



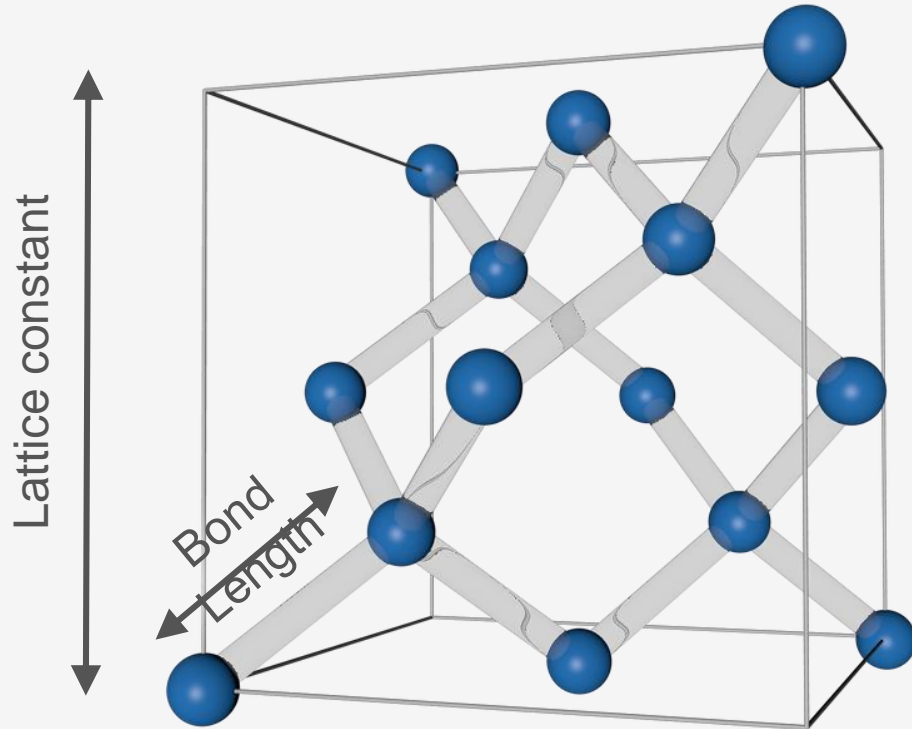
Semiconductor Materials

IV semiconductors: Si, Ge

		IIIA	IVA	VA	VIA	VIIA	VIIIA
		5	6	7	8	9	10
		B 10.811	C 12.011	N 14.007	O 15.999	F 18.998	Ne 20.180
		13	14	15	16	17	18
		Al 26.982	Si 28.086	P 30.974	S 32.065	Cl 35.453	Ar 39.948
IB	IIB						
29	30	31	32	33	34	35	36
Cu 63.546	Zn 65.38	Ga 69.723	Ge 72.64	As 74.922	Se 78.96	Br 79.904	Kr 83.798
47	48	49	50	51	52	53	54
Ag 107.87	Cd 112.41	In 114.82	Sn 118.71	Sb 121.76	Te 127.60	I 126.90	Xe 131.29
79	80	81	82	83	84	85	86
Au 196.97	Hg 200.59	Tl 204.38	Pb 207.2	Bi 208.98	Po [209]	At [210]	Rn [222]



Carbon, silicon and Germanium



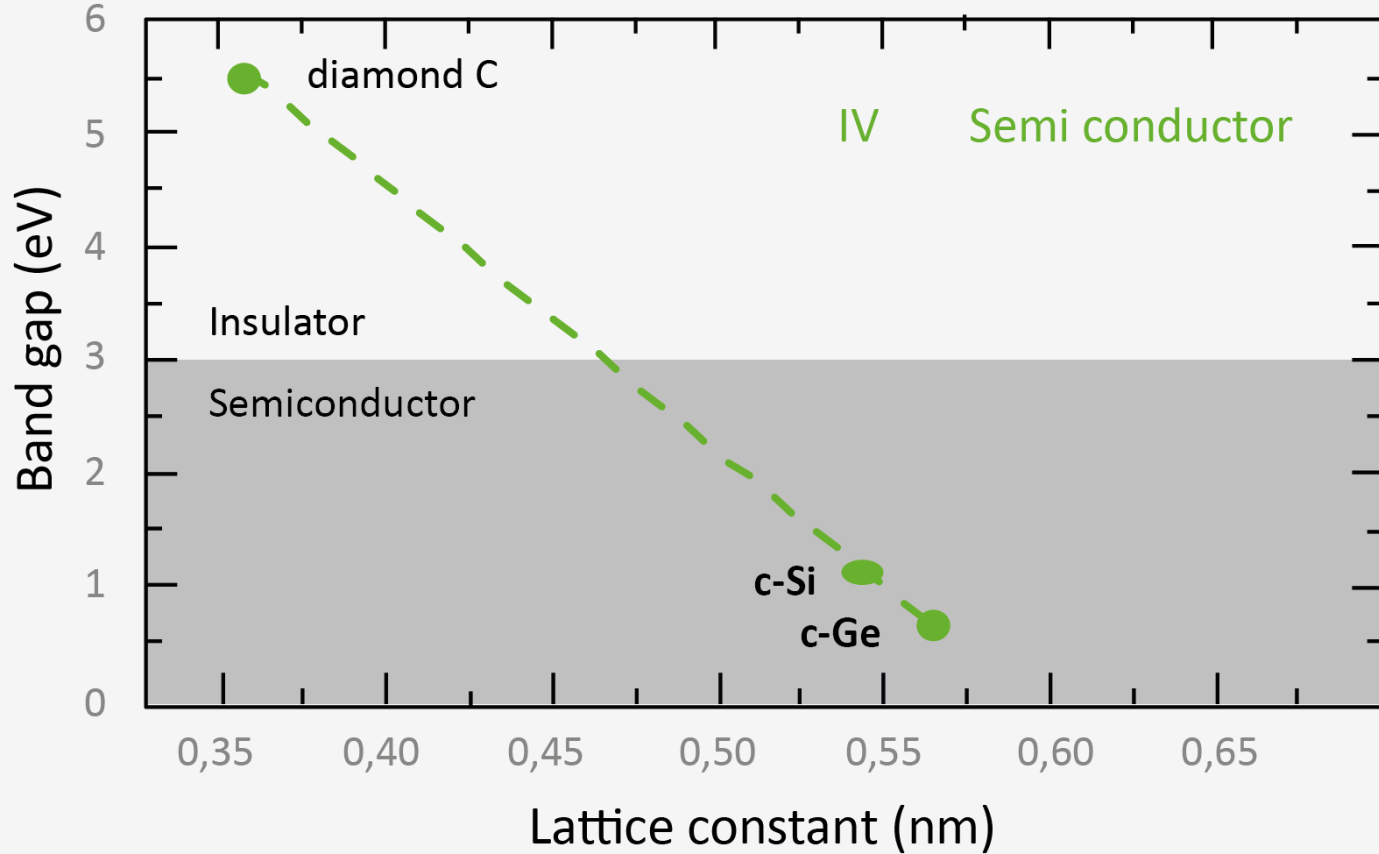
Lattice constant

=

$$\frac{4}{\sqrt{3}}$$

×

Bond Length



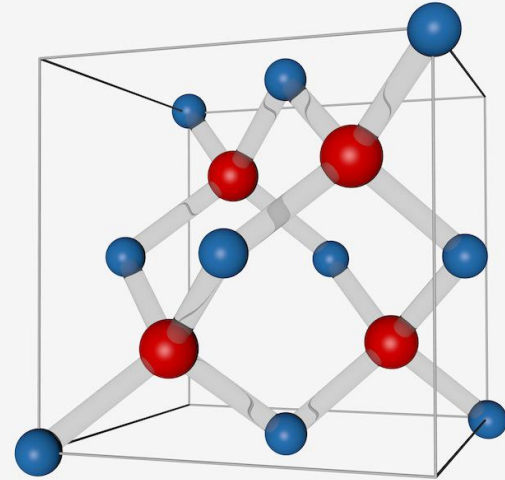
Semiconductor Materials

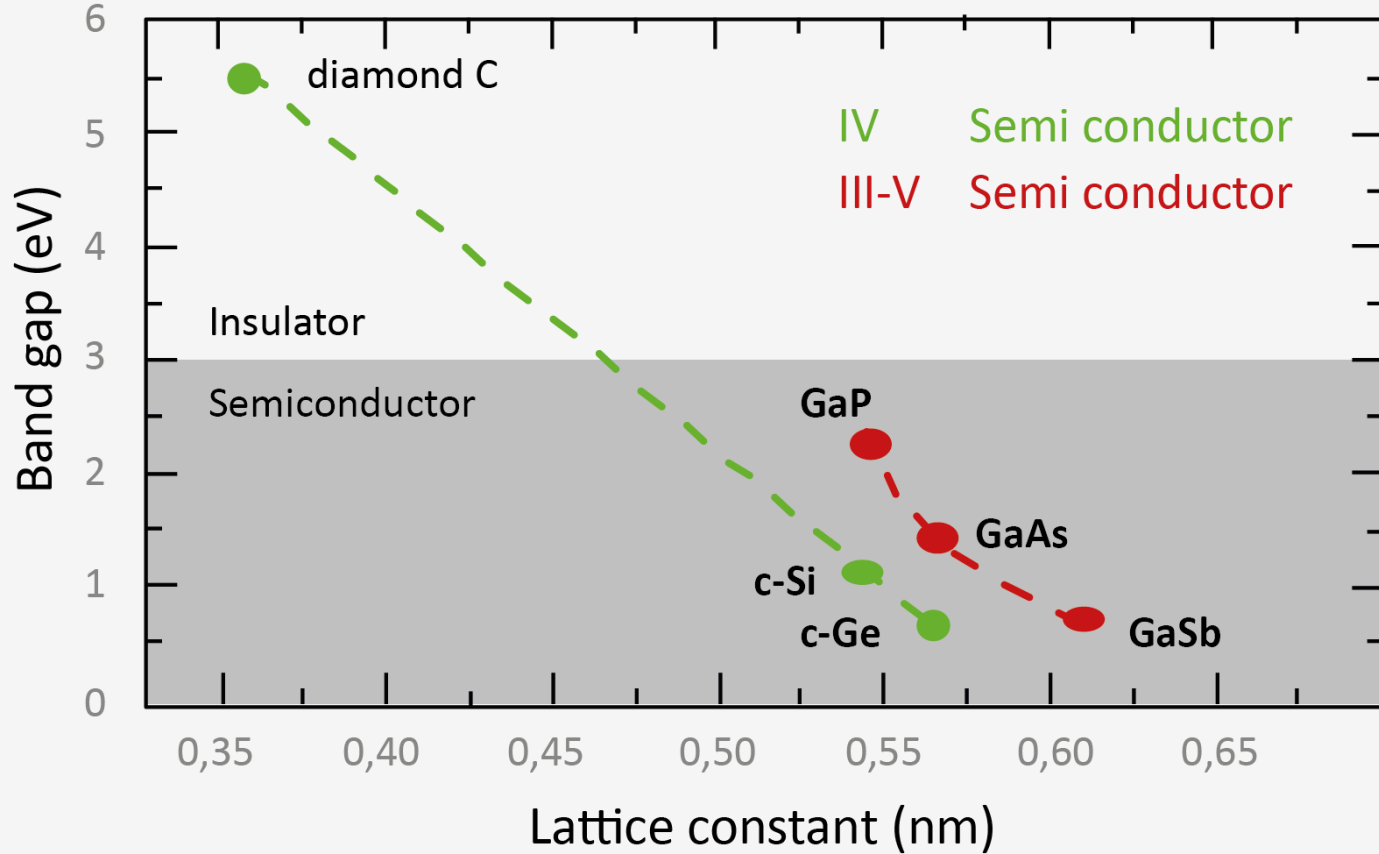
IV semiconductors: Si, Ge

III-V semiconductors:

							VIIIA
		IIIA	IVA	VA	VIA	VIIA	2 He 4.0026
		5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
		13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948
IB	IIB						
29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po [209]	85 At [210]	86 Rn [222]

GaAs:





Semiconductor Materials

IV semiconductors: Si, Ge

III-V semiconductors:

II-VI semiconductors

		IIIA		IVA		VA		VIA		VIIA		VIIIA	
		5	6	7	8	9	10					2	
		B	C	N	O	F	Ne					He	
		10.811	12.011	14.007	15.999	18.998	20.180					4.0026	
		13	14	15	16	17	18						
		Al	Si	P	S	Cl	Ar						
		26.982	28.086	30.974	32.065	35.453	39.948						
IB	IIB												
29	30	31	32	33	34	35	36						
Cu	Zn	Ga	Ge	As	Se	Br	Kr						
63.546	65.38	69.723	72.64	74.922	78.96	79.904	83.798						
47	48	49	50	51	52	53	54						
Ag	Cd	In	Sn	Sb	Te	I	Xe						
107.87	112.41	114.82	118.71	121.76	127.60	126.90	131.29						
79	80	81	82	83	84	85	86						
Au	Hg	Tl	Pb	Bi	Po	At	Rn						
196.97	200.59	204.38	207.2	208.98	[209]	[210]	[222]						

GaAs:

CdTe:

