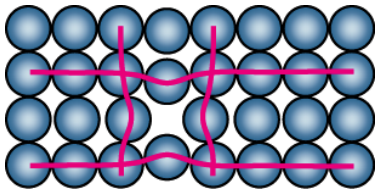
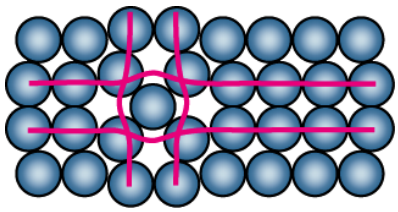
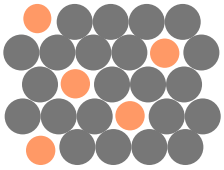
Point Defects

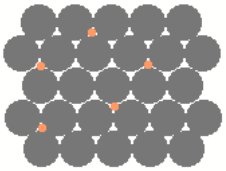




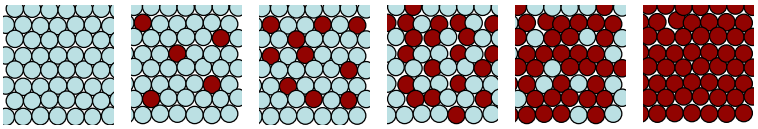
Impurities in solids



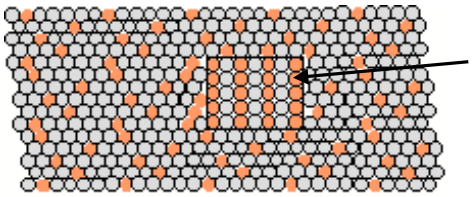
Substitutional solid solution
Cu in Ni



Interstitial solid solution
C in Fe



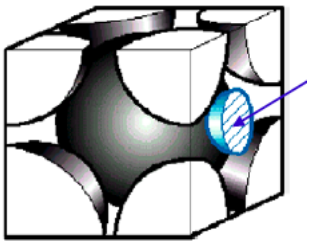
A complete series of solid solutions



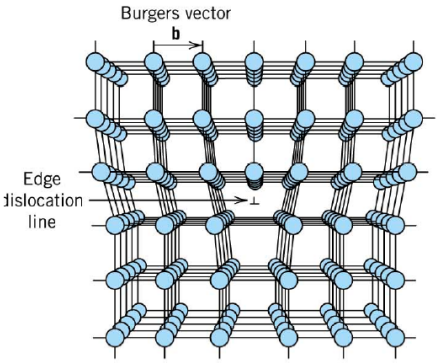
Element	*Atomic Radius (nm)*	*Crystal Structure*	*Electro-nega-tivity*	*Valence*
Cu	0.1278	FCC	1.9	+2
C	0.071			
H	0.046			
O	0.060			
Ag	0.1445	FCC	1.9	+1
Al	0.1431	FCC	1.5	+3
Co	0.1253	HCP	1.8	+2
Cr	0.1249	BCC	1.6	+3
Fe	0.1241	BCC	1.8	+2
Ni	0.1246	FCC	1.8	+2
Pd	0.1376	FCC	2.2	+2
Zn	0.1332	HCP	1.6	+2

Interstitial solid solutions

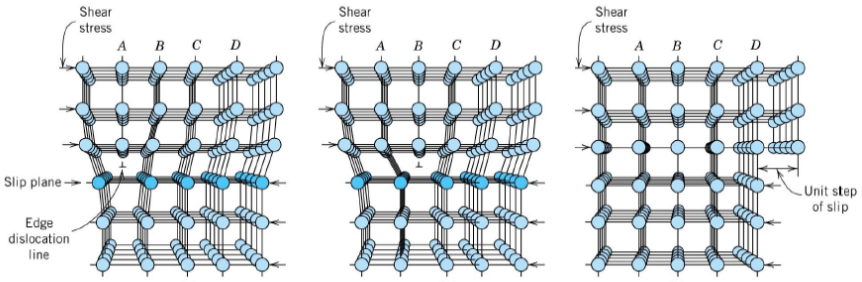
C interstitial atom in BCC iron

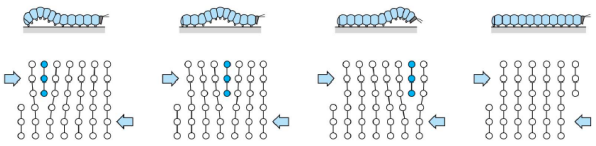


Edge dislocations

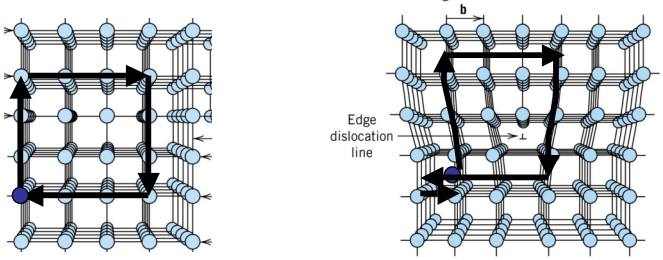


Dislocation movement

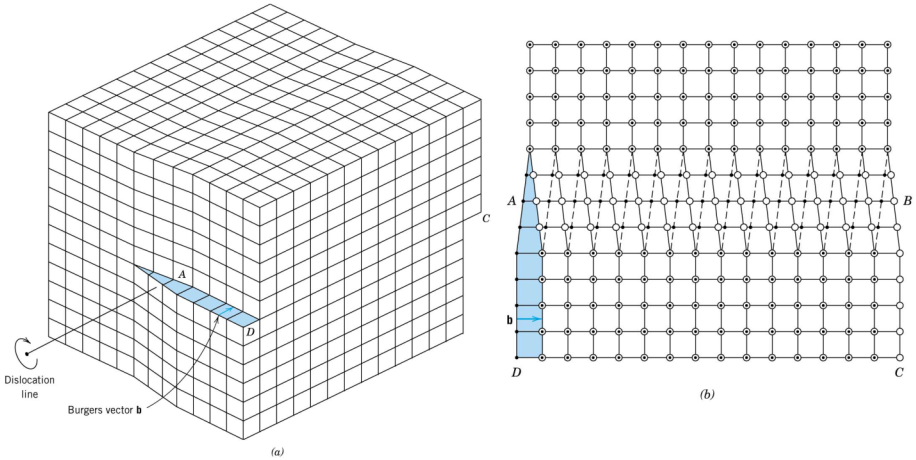




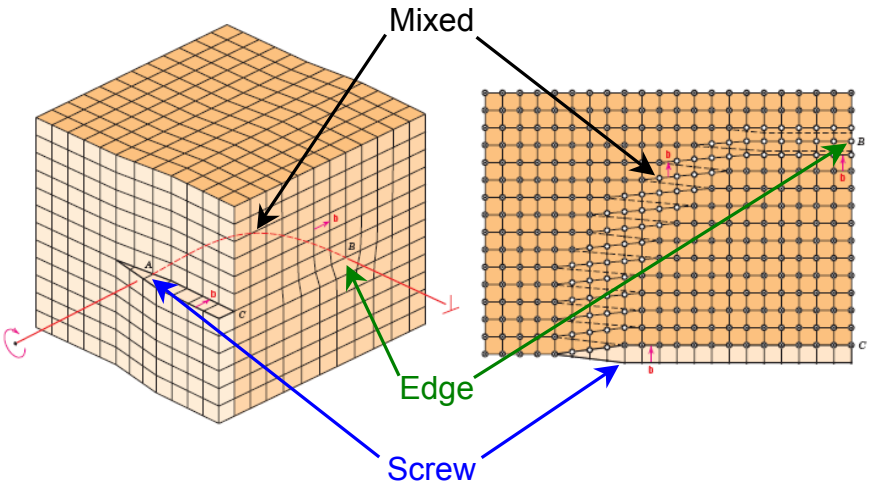
Burgers vector



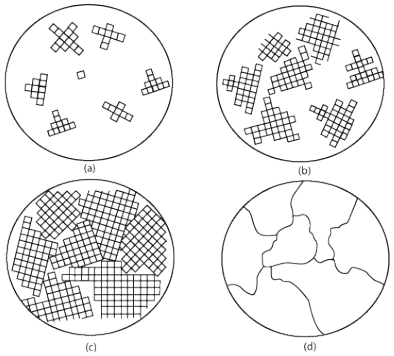
Screw dislocations

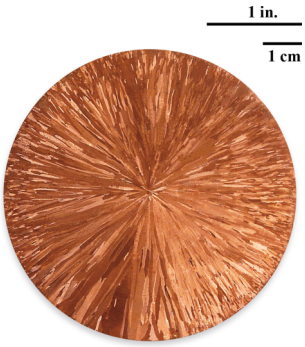


Edge, screw and mixed dislocations

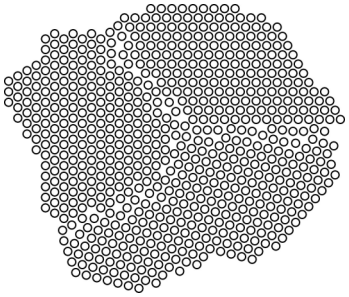


Grain boundaries from solidification

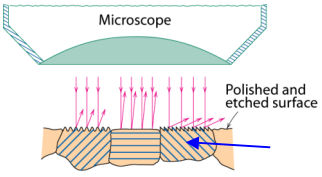




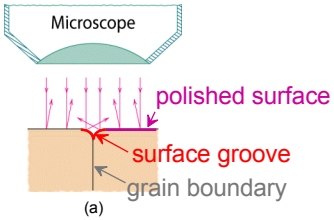
Grain boundaries



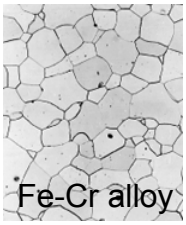
Optical microscopy



Micrograph of brass (a Cu-Zn alloy)



(a)



(b)

Equation summary

Equation Summary

Equation Number	Equation	Solving For	Page Number
4.1	$N_v = N\exp\left(-\frac{Q_v}{kT}\right)$	Number of vacancies per unit volume	92
4.2	$N = \frac{N_A\rho}{A}$	Number of atomic sites per unit volume	93
4.3	$C_1 = \frac{m_1}{m_1 + m_2} \times 100$	Composition in weight percent	95
4.5	$C_1' = \frac{n_{m1}}{n_{m1} + n_{m2}} \times 100$	Composition in atom percent	96
4.6a	$C_1' = \frac{C_1 A_2}{C_1 A_2 + C_2 A_1} \times 100$	Conversion from weight percent to atom percent	96
4.7a	$C_1 = \frac{C_1' A_1}{C_1' A_1 + C_2' A_2} \times 100$	Conversion from atom percent to weight percent	96
4.9a	$C_1'' = \left(\frac{C_1}{\frac{C_1}{\rho_1} + \frac{C_2}{\rho_2}}\right) \times 10^3$	Conversion from weight percent to mass per unit volume	97
4.10a	$\rho_{ave} = \frac{100}{\frac{C_1}{\rho_1} + \frac{C_2}{\rho_2}}$	Average density of a two-component alloy	97
4.11a	$A_{ave} = \frac{100}{\frac{C_1}{A_1} + \frac{C_2}{A_2}}$	Average atomic weight of a two-component alloy	97
4.16	$N = 2^{n-1}$	Number of grains per in.^{2} at 100× magnification	113

Dislocation movement

http://mrsec.wisc.edu/Edetc/SlideShow/slides/defects/bubble_defect_color_mov.html
Bubble raft model

http://mrsec.wisc.edu/Edetc/SlideShow/
Ball and stick model of dislocation movement

http://mrsec.wisc.edu/Edetc/SlideShow/
Caterpillar moving