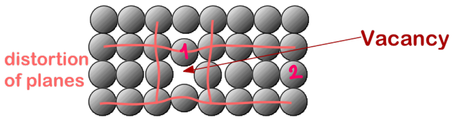
imperfections in solids

7 Ekim 2024 Pazartesi 08:45

point defects

vacancies:

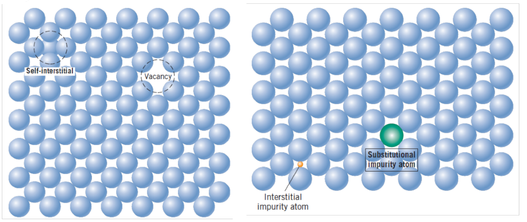


vacancies cause the sroms to have higher energy· a bonded atom has lower energy, thus atom number 1 has mhigher energy than the atom number 2· no·1 wants to create bonding, so it is easier for it to change place· defects make it easier to change the shape of material·
it is also easier to change the shape of a material after it is heated· it takes less force to change the shape of an object that is heated, than an unheated object·

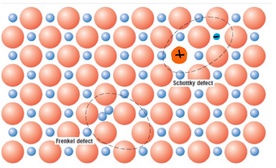
The equilibrium number of vacancies for a given quantity of material depends on and increases with temperature according to:

$$N_v = N \exp\left(-\frac{Q_v}{kT}\right)$$

self interstitials:
they are not as common as vacancies·



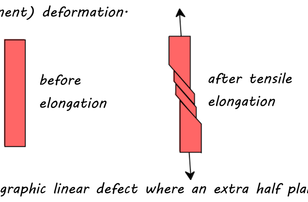
impurities in solids:
addition of impurity toms to a metal will result in **solid solution·**
interstitil=ara yer, substititon=yer alan
solvent:component in highest concentration (aka host)
solute: component present in minor concentration·
point defects in ceramics



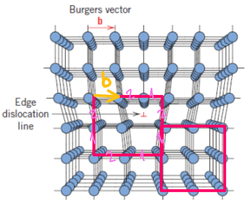
schottky: anion vacancy +cation vacancy
frenkel: cation vacancy+ cation interstitial

linear defects

dislocation: is a linear or one-dimensional defect· dislocation causes crystal planes to slip·
it creates plastic(permanent) deformation·



edge dislocation: crystallographic linear defect where an extra half plane of atoms is inserted into lattice·
burgers vector is the magnitude of the dislocation·

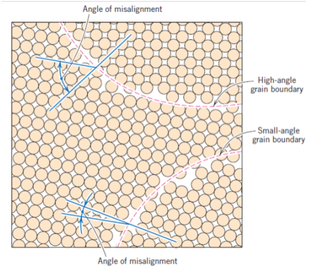


count atom by atom, try to create a rectangle with equal amount of atoms on each side, there will be a gap if there is edge dislocation· the vector to close that gap is expressed by burgers vector·

edge dislocations comes from solidification· screw dislocation is due to a sheer force· they usually happen together· if they are found together, it is called **mixed dislocation·** screw dislocations come from an external force·

interfacial defects

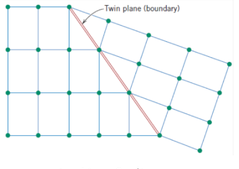
grain boundaries: the boundary seperating two small grains of crystals having different crystallographic orientations ·



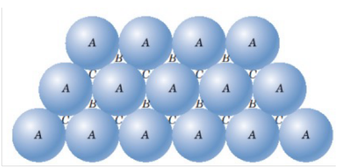
breaking the small angle boundary is harder than the high angle boundary

twin boundaries

there is a specific mirror lattice symmetry·



stacking faults



stacking faults are seen in FCC metals in close-packed planes