

Assignment 4

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Submit to Paul by Thursday 11/4/2004.

1. Calculate the equilibrium number of vacancies in 1 g of fcc Cu at 1200°C, given that the energy for formation of a vacancy is 0.9 eV/atom. The atomic weight of Cu is 63.546 g/mol and the Boltzmann constant can be expressed $k_B = 8.62 \times 10^{-5}$ eV/K.
2. (a) Which is more likely to form a Frenkel defect and why: NaI or NaCl ? (b) Which is more likely to form a Schottky defect and why: MgO or NaCl ?
3. Sketch the following: (a) A line dislocation in a crystal showing the Burgers circuit and the Burgers vector. (b) A screw dislocation in a crystal showing the Burgers circuit and the Burgers vector.
4. Stacking faults in fcc Co are common, but not in NaCl (even though NaCl also has atoms on fcc lattices). Why ?
5. What is a grain boundary. Sketch a schematic of a low angle, and of a high angle grain boundary.
6. When a cubic crystal converts to a tetragonal crystal (during some structural *phase transition*), why are a lot of planar defects created ?