Lecture 16

Sunday, May 04, 2008
3:33 PM

Ref: 1. Reed-Hill, Abbaschian, **Physical Metallurgy Principles, 3rd Edition**, *PWS Publishing Company*, 1994.

Course Notes:

- Homework is due by 5:00 pm today
- The second exam is coming up fast

Review:

- Last time we started our discussion talking about the variables which effect recrystallization and recrystallization temperature
- We figured out that typically the recrystallization temperature occurs higher than a homologous temperature of 1/3
- We then started talking about grain growth -- how if you expose a polycrystalline specimen to a temperature high enough to activate
- Grain boundary migration you will see grain growth
- We discussed that the driving force for grain growth is to minimize grain boundary energy
- We saw a movie that demonstrated grain growth
- We saw how the big grains "eat" the little ones
- We then discussed how the determining factor in which grains grow and which shrink is grain boundary curvature
- All grain boundaries grow to the center of curvature
- Big grains -- with more than 6 sides (hexagonal) tend to have their center of curvature outward
- Little grains -- with less than 6 sides tend to have their center of curvature inward
- We then talked about the parabolic mathematical relationship that is typically used to describe grain growth $D = kt^n$
- We then changed course 90 degrees and started talking about Phase Diagrams
- We defined a:
  - Component: pure metal or compound from which an alloy is composed
  - Phase: a homogenous portion of a system that has uniform physical and chemical characteristics
  - Phase Diagram: is a map of phase stability, dependent on pressure, temperature, and composition

- We provided a definition of Equilibrium based on Gibbs Free Energy: $\Delta G = 0$, and we discussed how phase equilibrium indicates phase stability with time -- both chemical and physical
- We then looked at the 1 component phase diagram for Water and discussed Gibbs Phase Rule
- We provided a definition of solubility limit: the maximum concentration of solute for which a single phase solution occurs
- We then started examining binary phase diagrams, where we have 2 components, we hold pressure constant, and we vary the composition
- We began examining the Cu-Ni Binary Phase diagram -- which is a isomorphous system

Rest of Lecture is available in PowerPoint Presentation Paired with Lecture 16