

Lecture 17

Sunday, May 11, 2008
3:40 PM

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

Course Notes:

- Exam 2 is a week from Today
- Lab IV is this week
- You have homework due on Friday
- ASM Meeting tomorrow night
- Peter's note about ASM and ASTM manuals -- electronic copies are only available on campus

Review:

- Two times ago we started our discussion of binary equilibrium phase diagrams
- Last time we examined the Ni-Cu equilibrium phase diagram- which is an isomorphous phase diagram -- in more detail
- We defined the liquidus line and the solidus line
- We talked about solid solutions
- We discussed how pure metals have melting points, but most metal alloys have melting ranges
- We then discussed the lever law and how to use tie lines within 2 phase fields to determine phase composition and phase quantity
- We talked about equilibrium cooling in the isomorphous Ni-Cu system
- We talked about how non-equilibrium cooling can result in microstructural composition variation
- We talked about how the alloying affects the mechanical properties in the Ni-Cu system
- We then switched systems and began discussing the Pb-Sn system, which is a eutectic system
- We looked at how the Eutectic reaction involves a liquid becoming two solid solutions
- We added solvus line to our lexicon
- We then considered 4 different cooling scenarios at 4 different compositions and how those lead to 4 different and unique microstructures -- which in turn would lead to different mechanical properties
 - In particular we discussed the eutectic structure and how it is formed by limited solubility of component A in the β solid solution and limited solubility of component B in the α solid solution
 - How elemental rejection and diffusion leads to a lamellar phase structure
- We finished our discussion defining hypo versus hyper eutectic compositions

Rest of Lecture is available in PowerPoint Presentation Paired with Lecture 17