

Problem set 6.

Problem 1

Suppose that you are interested in a phenomenon which depends on the solubility of silicon in aluminum at half the absolute melting point, which corresponds to about 200 C. This scenario is realistic in that substitutional* diffusion (ROT) is still significant at this temperature.

The following are ALL in atoms/atom, X.

- a. Go to the literature for data on the solubility of Si in Al. Volume 3 of the ASM metals handbook is one source. Plot $\ln X$ vs. $1/T$ from the eutectic temperature to as low as you dare. Does it make sense to extrapolate your plot to 200 C? Why or why not?
- b. The text states that the pre-exponent for substitutional solubility should be unity. That is, the solubility extrapolates to unity at infinite temperature. Plot your data with this pre-exponent.
- c. Your boss hauls you on the carpet and demands your best estimate of the Si solubility in Al at 200 C. What number do you give and why?

Problem 2

- a. Go into the magnetics literature and photocopy B-H curves for soft and for hard magnetic materials. Submit them with this homework.
- b. Define all terms in both figures. Explain just what properties make each type a good or bad magnetic material.