Name:

Homework for Lecture 16-18

Consider the precipitation of a spherical B-rich phase (β phase) from a dilute solution (α phase) of B in A. Suppose the original concentration of B in the solid solution is $C_0=5\times10^{21}$ atoms/cm^3, the diffusion coefficient of B is $D=2\times10^{-10}$ cm^2/sec, and the interface transfer parameter of B is $M=2\times10^{-6}$ cm/sec. The equilibrium concentration of B in the α and the β phases (C_α and C_β) are 1.625×10^{21} atoms/cm^3 and 3.75×10^{22} atoms/cm^3, respectively. In a quasi-steady state, the averaged concentration of B in the bulk (C_t) remains approximately the same as C_0. When the radius of the β particle is r =0.8 μm=8×10^{-5} cm,

(1) what is the concentration of B next to the α/β interface, C_r ?

(2) and what is the β particle growth rate $(\frac{dr}{dt})$?