CHE323/384 Chemical Processes for Micro- and Nanofabrication
Chris Mack, University of Texas at Austin

Homework #7

1. For CVD deposition of a film, it is found that the mass transfer coefficient $h_G = 10.0$ cm/s and the surface reaction rate coefficient $k_S = 1 \times 10^7 \exp(-1.9 \text{ eV}/kT)$ cm/s. For a deposition at 900˚C, which CVD system would you recommend using: (a) a cold-walled, graphite susceptor type: or (b) a hot-walled, stacked wafer type? Explain your answer.

2. Plot the deposition rate (on a log scale) versus 1/T (Kelvin), for 600-1100˚C, for an atmospheric CVD system with the following parameter values:

   $h_G = 0.5$ cm sec^{-1} (assumed independent of temperature)
   $k_S = 4 \times 10^6 \exp(-1.45 \text{ eV}/kT)$ cm/s
   Partial pressure of incorporating species = 1 torr
   $N = 6.2 \times 10^{22}$ cm^{-3}

   Identify the reaction and mass transfer limited regimes.

3. Repeat problem 2 when the total pressure is decreased to 1 torr, so that h_G increases by 100 times. Assume that the partial pressure of the incorporating species remains the same.

4. Campbell textbook, Chapter 13, problem 5.

5. Campbell textbook, Chapter 13, problem 6.