

Chemical Engineering 444/ 544
FINAL PROJECT: Optimization of a Virtual CVD Reactor
Prof. Milo Koretsky

Objective:

Come up with the “recipe” (i.e. choice process parameters) for a Low Pressure Chemical Vapor Deposition (LPCVD) reactor at as low a cost as possible.

Overview:

Your team’s task is to develop a “recipe” for high volume manufacturing of Silicon Nitride (Si_3N_4) using Low Pressure Chemical Vapor Deposition (LPCVD). The growth and measurements will be made via computer simulation in OSU’s *VirtualCVD* reactor. You should develop a recipe that grows Si_3N_4 to a target thickness of 1500 Å uniformly within the wafer and from wafer to wafer. The furnace has a capacity for batches of up to two hundred 300 mm wafers. The wafer spacing is 6.35 mm. It has 5 temperature zones that can be set individually. In addition, you can set the flow rates of ammonia (NH_3) and dichlorosilane (DCS) feed gases, the reactor pressure and the time. You will also have access to a (*Virtual*) ellipsometer, with which you can measure the film thicknesses at the points on any wafer that you select. You will be charged \$5,000 for each run and \$75 for each measurement (in *Virtual*\$, of course)

Deliverables

Three major deliverables are required: a **design strategy memo**, a **final written report** and a **final presentation** (during the scheduled final exam: 3/17/05 9:30 AM).

- A. **Design strategy memo.** You need to come up with a strategy to explore the parameter space. It may be helpful to consider using design of experiments (DOE) in your approach. A tutorial on DOE is available on the class web site. This memo needs to be approved to get your access code to run the *VirtualCVD* reactor. Access codes will only be available the week 2/28 – 3/4.
- B. **Final Written Report.** Your report should include the following items:
- i. Introduction
 - ii. Design strategy
 - iii. Summary of the results of the runs
 - iv. Analysis
 - v. Final recipe
 - vi. Final cost
- C. **Final Presentation.** Prepare a 10 minute Powerpoint presentation