

Lab 3 Copper Sputtering – Variations in Process Gas

Name: _____

Purpose

The purpose of this lab is to understand the differences in sputtered film characteristics due to changes process gas composition.

We will evaluate films created by using pure argon, pure nitrogen, and reactive sputtering with an argon/nitrogen mixture. Note: the latter experiment requires a second MFC.

Required Equipment and Tools

1. PPTS-1A Plasma Trainer
2. Equipment Manuals including:
 - a. PPTS-1A Manual
 - b. PB-3 RF Power Supply manual
 - c. Magnetron cathode manual
 - d. Vacuum pump manuals (high vacuum turbo pump and mechanical backing pump)
3. Safety glasses
4. Wafer tweezers
5. Substrates (glass or silicon)

Part 1: Defining the Experiment

Based on the results in Lab 2, develop an experiment plan based on what you feel are optimum parameters for pressure and power.

- You will make two initial runs with deposition times of 2.5 and 7 minutes using pure argon.
- You will then make two runs at the same deposition times using pure nitrogen.
- The final two runs will be made using a mix of 80 percent argon and 20 percent nitrogen, also for the same deposition times. As noted above, this requires a second MFC. The PPTS-1A manual has instructions for setting up the ratio control conditions.

Use the same evaluation plan developed in Lab 2 to analyze your experimental runs.

Part 2: Deposition

At this point you are ready to run the experiments. Be as consistent as possible in terms of substrate selection/quality, substrate cleanliness, location of the substrates on the substrate holder (make use of the alignment pins) and general operating procedures.

Record all of your data (including final matching network tuning settings) and note any anomalous conditions.

Part 4: Analysis and Conclusions

Following your assessment methods that were developed in the Evaluation Plan, detail your findings and any conclusions you might be able to draw on film quality, film structure and composition and deposition rate.