

## 520.495/530.495/580.495 Microfabrication Laboratory

### Flow Cytometer Laboratory Assignment 8 Anodizing Bonding



This week we will finish the fabrication of the flow cytometer by anodically bonding the Si substrate to a pre-drilled borofloat glass. The bonding will help to encapsulate the microfluidic channels so that pressure can be applied at the inlets during the testing of the chip.

### **I. PRELAB ASSIGNMENT:**

1. Make a drawing and describe the principle of anodizing bonding. What is polarity used on silicon and on glass?
2. What voltage and temperature are required to do the anodizing bonding? Is this voltage lethal to people?

### **II. LAB WORK:**

#### **Preliminaries:**

1. Transfer wafers with tweezers, try to grasp the wafer at the same place each time, usually at the flat.
2. All processing and the cleaning procedures (except using spin/rinse/dryer) should be done in the hood. Aprons, protective sleeves, gloves, face shield, lab coat, and goggles must be worn during cleaning procedures. Wear plastic disposable gloves **always**.
3. Today we will be working with extremely high voltages and temperatures. BE EXTRA CAREFULL!

#### **Task #1: Marking and Drilling Fluidic Ports:**

1. Set the Hotplate temperature to 120 °C.
2. Heat the borofloat glass on the hotplate for about 60 secs.
3. Apply the wax onto the glass by rubbing the wax stick onto the heating glass.
4. Place the microscope slide on top of the melting wax.
5. Remove the bonded glass piece from the hotplate and allows it to cool down.
6. Mark the 4 positions to be drilled on the borofloat glass using CAVITY MASK.
7. Drill through the borofloat glass at the 4 marked positions.
8. Separate the bonded piece by heat it up at 120 °C.
9. Place the borofloat glass piece into acetone to completely remove the wax.

#### **Task #2: Anodic Bonding: (DANGER! HIGH VOLTAGE)**

1. Align and bond the borofloat glass with diced microfluidic chips.
2. Be very, very careful with this task because we are dealing with high temperature and extremely high voltage.
3. Turn off the power generator before touching anything. NEVER leave the bonding apparatus unattended!
4. Bonding Temperature = 400 °C.
5. Bonding voltage = 1000~2000 V
6. Bonding time = 10 mins (but it may vary, ask the lab assistant for advice)

### **III. POSTLAB ASSIGNMENT:**

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1. Why did we use borofloat glass to do the bonding instead of regular glass such as the microscope slice?
2. How to improve the bonding quality?