

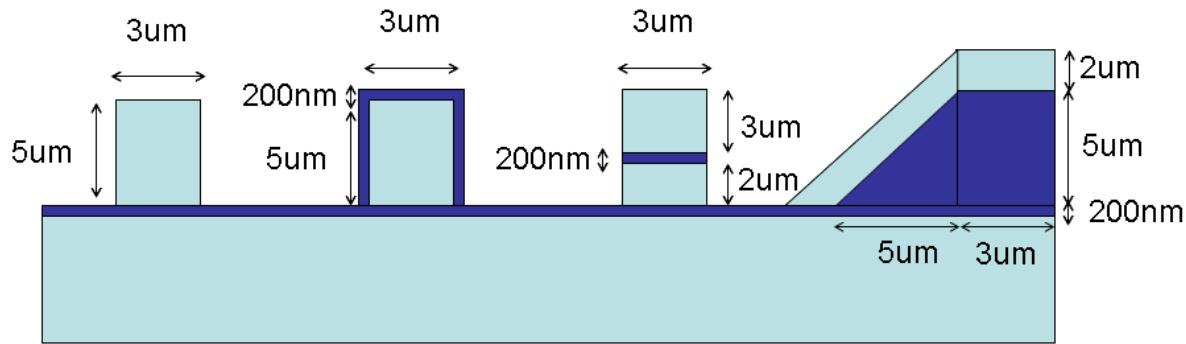
Assignment #6:

Due: 10/13/2011

- 1) Circular holes with diameter and spacing of $20 \mu\text{m}$ are patterned on a silicon wafer using a $4 \mu\text{m}$ thick positive photoresist. The holes are etched using Deep Reactive Ion Etching (DRIE). If the etch rate is $2.5 \mu\text{m}/\text{min}$ and the selectivity of Si to photoresist is 50:1.
 - i) Draw a cross-section of the structure before the etching ($t=0$)
 - ii) Draw a cross-section of the structure after etching after 30 minutes ($t=30$)
 - iii) Draw a cross-section of the structure after etching after 1 hour etching ($t=60$).
 - iv) Suggest one of possible ways to adjust your fabrication process so that the structures would etch properly for 2 hours of etching.

In the cross section drawings, please label all materials and critical dimensions (layer thicknesses, spacing). Fail to do so will result in lost of points.

2. The cross-section structure below (starting point) is etched in a RIE system. Assume that the RIE recipe is 100% anisotropic (100% directional) and it etches silicon/polysilicon at a rate of 1um/min and has a silicon-to-oxide selectivity of 5:1.



- Silicon/Polysilicon
- Silicon Oxide

Draw cross sections of the structure after etching for

- i) 1 minute
- ii) 2 minutes
- iii) 4 minutes
- iv) 10 minutes

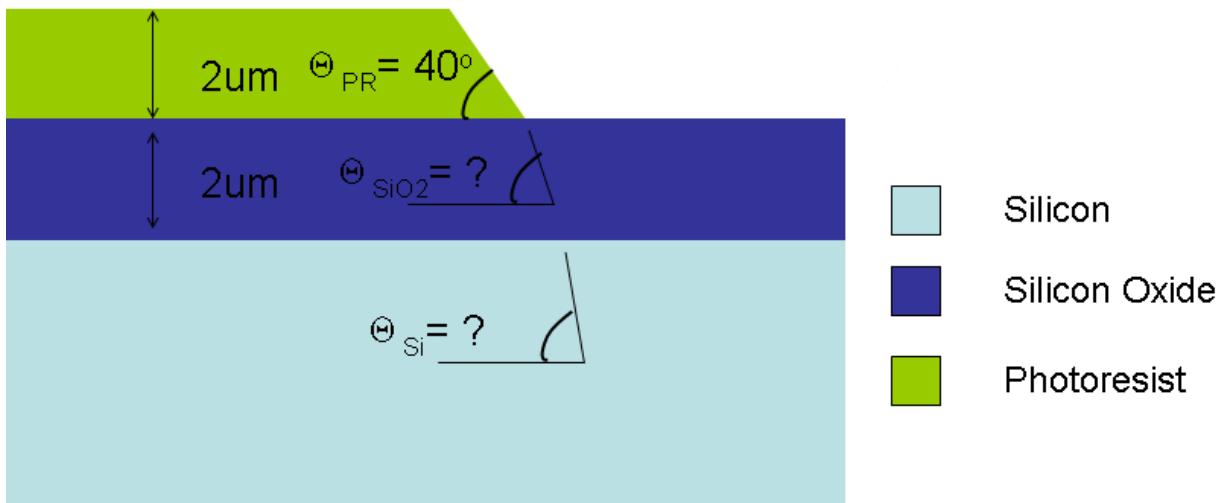
In the cross section drawings, please label all materials and critical dimensions (layer thicknesses, width and height). Fail to do so will result in lost of points.

3. The cross-section structure below (starting point) is again etched in a RIE system. Again, assume 100% anisotropic. Assume that the photoresist has an initial angle of 40° and the etch rate are defined below.

Photoresist etch rate: 100nm/min

Silicon oxide etch rate: 200nm/min

Silicon etch rate: 300nm/min



Draw cross sections of the structure after etching for

- i) 5 minute
- ii) 10 minutes
- iii) 20 minutes
- iv) 30 minutes

In the cross section drawings, please label all materials and critical dimensions (layer thicknesses, angles). Fail to do so will result in lost of points.

Food for thought (*optional, no credit*): What would happen if the recipe was isotropic with different lateral etch rate for each material? How would the etch profile, depth, and angle change then?