

Homework #1

Some likely questions on the exam. Will not be collected or graded.

1. List five advantages that dry etching has when compared to wet etching. Also, list three of the most important disadvantages.
2. Explain why the term “ion assisted etching” is a better description of dry etching processes that rely on both chemical and physical etching effects than is the term “reactive ion etching.”
3. For some VLSI fabrication process, the maximum allowable temperature is 900C. Suggest four techniques that are candidates for producing layers of planarized dielectric material between two conducting layers.
4. Describe diffusion mechanisms. Why is it necessary to clean wafers using Piranha Etch ($\text{H}_2\text{SO}_4/\text{H}_2\text{O}_2$) and Heavy Metal Clean ($\text{HCl}/\text{H}_2\text{O}/\text{H}_2\text{O}_2$) solutions prior to diffusion?
5. Draw an etch profile for the mask opening below for typical isotropic and anisotropic etches assuming that the etch is allowed to continue until it just reaches the bottom edge of the substrate.

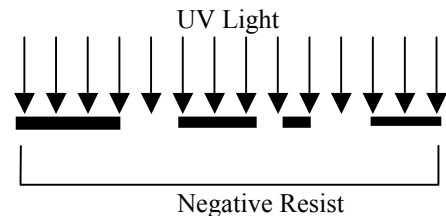
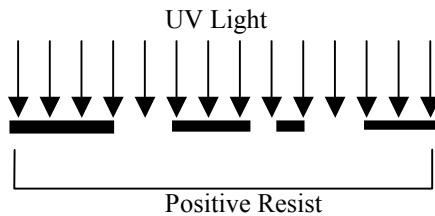


Isotropic



Anisotropic

6. Compare the advantages and disadvantages of using either an electrochemical or boron diffusion etch stop to produce a membrane using KOH as the etchant.
7. Draw the pattern that will be left with the following exposures:



8. What are the advantages and disadvantages of using e-beam lithography compared to typical photolithography using UV radiation.
9. Your polyimide photoresist requires $100 \text{ mJ}/\text{cm}^2$ per micron of thickness to be developed properly. Your lamp provides $1000 \text{ W}/\text{m}^2$. How long do you need to expose a 20 micron thick film?
10. Describe what happens chemically to both positive and negative resists when exposed to UV radiation.