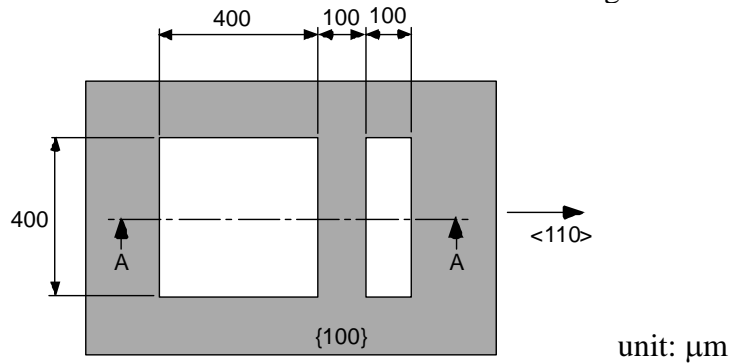
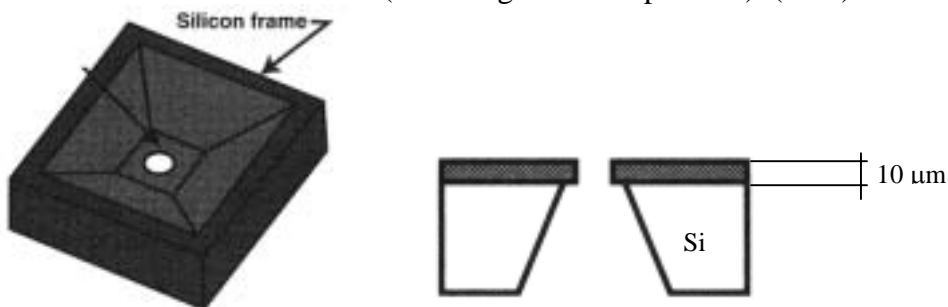


微機電系統導論期中考 (92/11/12)

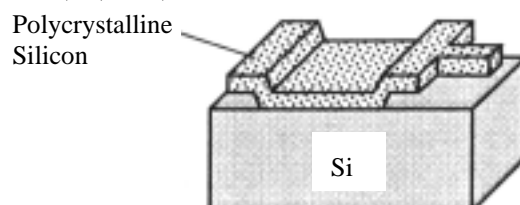
1. Explain the following terms using three to four lines. You can also use sketches if necessary. (30%)
 - (a) AFM (Atomic Force Microscopes)
 - (b) Epitaxial (Epitaxy)
 - (c) RIE (Reactive Ion Etching)
 - (d) PSG (Phosphosilicate glass)
 - (e) Lift-off
 - (f) Ferroelectricity
2. Please explain the detailed processes of standard lithography. (10%)
3. Please explain and compare three basic lithographic exposure methods. (10%)
4. Please explain and compare two doping methods used in MEMS technology. (10%)
5. The following mask pattern is used in the KOH etching of a {100} silicon wafer. The thickness of the wafer is 500 μm . The etch rate of {100} is assumed 50 $\mu\text{m}/\text{h}$, {110} 80 $\mu\text{m}/\text{h}$, and {111} 0 $\mu\text{m}/\text{h}$. Please draw and dimension the cross section view A-A if the etching time is 3 hours. (10%)



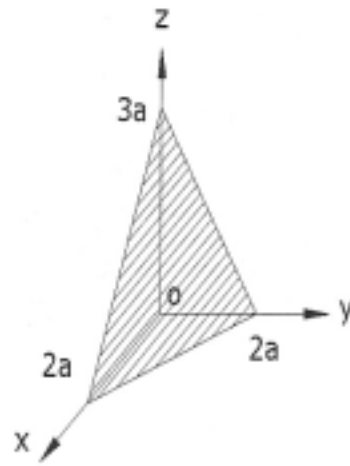
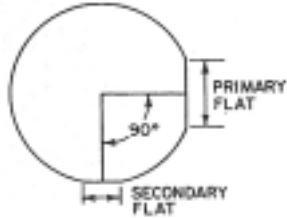
6. How to fabricate long narrow trenches with vertical sidewalls using anisotropic wet etching of silicon wafer. Your answer should include the selection of wafer and the orientation of the pattern in the mask. (10%)
7. A membrane nozzle is shown in the following figure. Make a possible flow chart with cross section view for fabrication of this structure (including the mask patterns). (10%)



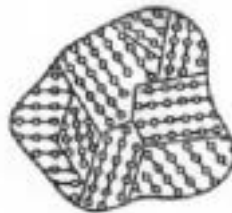
8. A free-standing cantilever fabricated using surface micromachining is shown in the following figure. Make a flow chart with schematic representation explaining the process steps making this structure (including the mask patterns). (10%)



9. (a) What's the preferred material as the patterning layer in KOH etching mask?
 (b) Which type of anisotropic wet etching of silicon is compatible with MOS and CMOS (IC) processing?
 (c) What is the Miller index of the right plane?
 (d) Which type of silicon wafer has the following appearance?



- (e) What's the crystal structure of the following figure? (Crystalline, Polycrystalline, Amorphous)



Simple answer questions (10%)