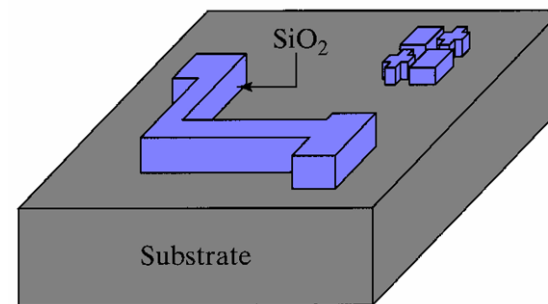
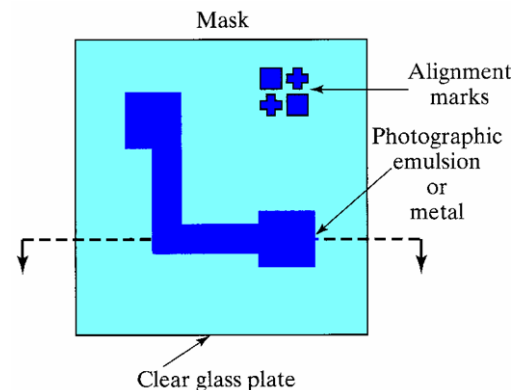


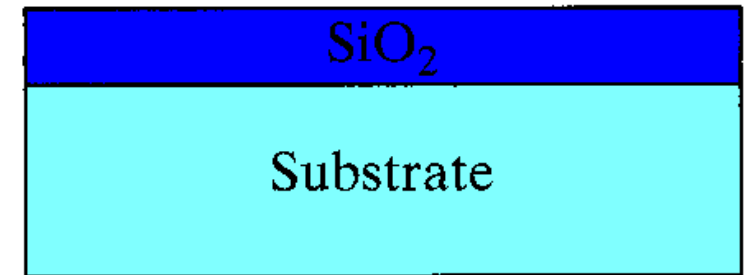
Photolithography

- The patterns from the mask are transferred to light-sensitive material called photoresist using UV light.
- Photolithography is usually used in conjunction with Etching to transfer the mask pattern to the material already grown or deposited on the silicon wafer substrate.
- For example, if the following mask pattern is to be created on a layer of silicon dioxide on the substrate,
 - ✓ Silicon Dioxide must first be grown or deposited all over the substrate surface
 - ✓ Photolithography is done
 - ✓ Etching is carried out to remove the silicon dioxide not covered by the photoresist pattern after which the photoresist, which is no longer needed is removed.



Material Layer Formation

- This is not part of the photolithography process steps.
- Silicon wafer substrate is first covered with the material layer if the pattern is to be transferred to this material layer & etching will be required after photolithography
- Examples are SiO_2 , Si_3N_4 , polysilicon, metals etc.
- If only the photoresist pattern is required then there is no need to form this material layer or to perform etching after photolithography.



Photolithography Process Steps

Material layer
formation on the
substrate, if necessary



Photoresist Application



Soft Bake



Mask Alignment



UV Light Exposure



Developing



Hard Bake

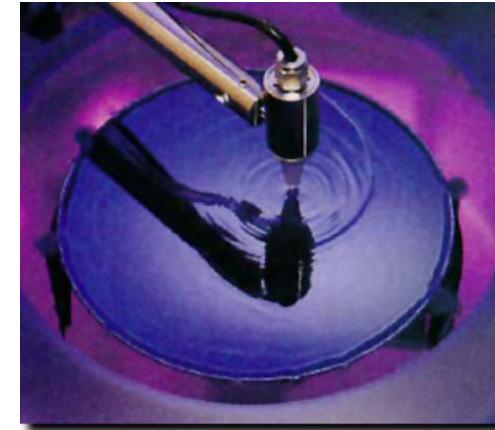


Etching, if necessary

Photolithography Process Steps

Photoresist Application

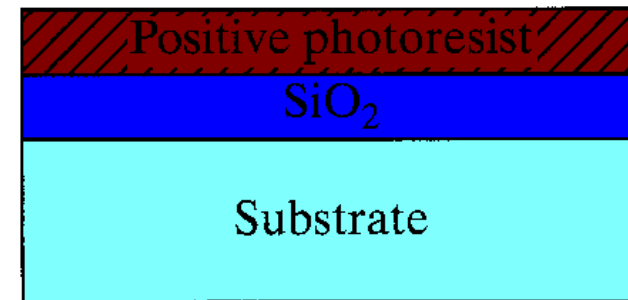
- Surface of silicon wafer substrate is coated with photoresist by spin coating (1000rpm to 5000rpm).



Photoresist Application
(Ontrak)

Soft Bake

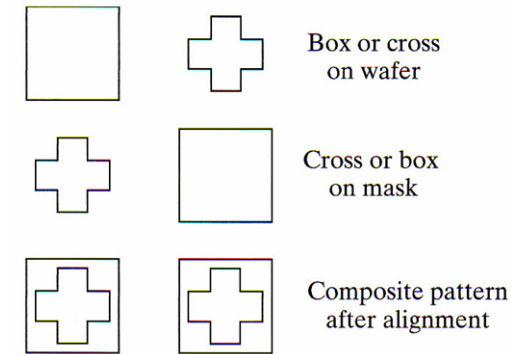
- The wafer is heated up in an oven to remove solvent & improve adhesion.



Photolithography Process Steps

Mask Alignment

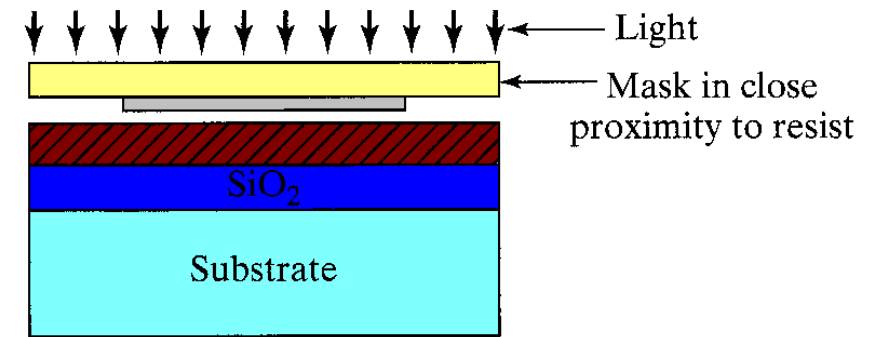
- Alignment marks are used so that all masks to be used for the complete fabrication of the IC shall be aligned accordingly.



Same Equipment

UV Exposure

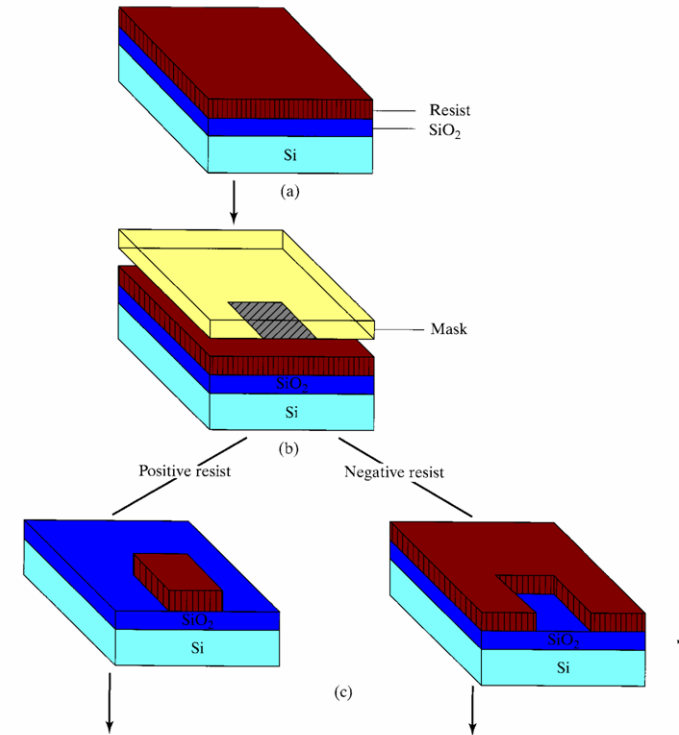
- Photoresist is exposed through the mask with high-intensity ultraviolet light.



Photolithography Process Steps

Development

- The pattern of the mask is now revealed on the photoresist.
- Positive photoresist exposed to UV light will be washed away by developer.
- Negative photoresist remains on the surface when exposed.
- Positive resist resolution is better and is the main type of resist in VLSI.



Resist and silicon dioxide patterns following photolithography with positive and negative resists.

Photolithography Process Steps

Hard Bake

- The wafer is heated up in an oven to harden the photoresist and to improve adhesion.

After Etching of the material layer (formed before photolithography) not protected by the photoresist pattern. The photoresist is then removed because it is no longer needed.

