

Q1. List the steps needed for making a complete monolithic silicon integrated circuit.

1. Deposition processes = oxidation, diffusion/ion implantation, chemical, vapor deposition and sputtering
2. Photolithography = exposure (printing, imaging) developing and
3. Pattern transfer = including etching and plating

From a higher level, we know that a monolithic integrated circuit begins when sand is gathered. In the united states, frac sand is mined intensively from Wisconsin, Illinois, Minnesota, and Michigan. This type of sand is composed of small, uniform particles which are ideal for forming mono-crystalline silicon ingots. These ingots are created by allowing a seed crystal to propagate its structure and slowly create a uniform crystalline structure. This process is known as Czochralski crystal growing.

This ingot is then sliced into wafers which are polished down to a thickness of about 725 μm . These wafers are then cleaned and then a dielectric layer of Silicon Dioxide is allowed to form on the wafer through exposure to Oxygen. This formation of silicon dioxide is the beginning of the deposition process. This dielectric formation is followed by diffusion, deposition, and sputtering. The goal of the deposition process is to add the necessary sub-layers that will then be removed or modified to create the circuit.

Photolithography and pattern transfer follow deposition and are the steps during which the circuit is formed. In essence, light to which the deposited material is vulnerable is used in juncture with a mask to develop the circuit onto the wafer.

Q2. Which semiconductors, other than silicon are commercially used for making ICs?

Germanium

Aluminium

Poly silicon