

Almost all of today's electronic technology involves the use of semiconductors, with the most important aspect being the [integrated circuit](#) (IC), which are found in [laptops](#), scanners, [cell-phones](#), etc. Semiconductors for ICs are mass-produced. To create an ideal semiconducting material, chemical purity is paramount. Any small imperfection can have a drastic effect on how the semiconducting material behaves due to the scale at which the materials are used.^[4]

A high degree of crystalline perfection is also required, since faults in crystal structure (such as [dislocations](#), [twins](#), and [stacking faults](#)) interfere with the semiconducting properties of the material. Crystalline faults are a major cause of defective semiconductor devices. The larger the crystal, the more difficult it is to achieve the necessary perfection. Current mass production processes use crystal [ingots](#) between 100 and 300 mm (4 and 12 in) in diameter which are grown as cylinders and sliced into [wafers](#).

There is a combination of processes that is used to prepare semiconducting materials for ICs. One process is called [thermal oxidation](#), which forms [silicon dioxide](#) on the surface of the [silicon](#). This is used as a [gate insulator](#) and [field oxide](#). Other processes are called [photomasks](#) and [photolithography](#). This process is what creates the patterns on the circuitry in the integrated circuit. [Ultraviolet light](#) is used along with a [photoresist](#) layer to create a chemical change that generates the patterns for the circuit.^[4]

Etching is the next process that is required. The part of the silicon that was not covered by the [photoresist](#) layer from the previous step can now be etched. The main process typically used today is called [plasma etching](#). Plasma etching usually involves an [etch gas](#) pumped in a low-pressure chamber to create [plasma](#). A common etch gas is [chlorofluorocarbon](#), or more commonly known [Freon](#). A high [radio-frequency voltage](#) between the [cathode](#) and [anode](#) is what creates the plasma in the chamber. The [silicon wafer](#) is located on the