

An ion implanter is a high voltage particle accelerator. It produces beams of ions at high velocities that penetrate the surface of wafers. Ion implantation is a crucial part of Microelectronic Engineering. Silicon is the material most often used in microchips which is a semiconductor. This means it is neither a conductor nor an insulator, it is somewhere in the middle. We can change the conductivity by bombarding the material with ions (ion implantation). This in turn allows us to make transistors which are the building block for all microchips.

This is how it works: there is a source that contains all the ions that can be implanted. Once an ion is chosen to implant, the magnetic field is changed to select that ion. Certain magnetic fields allow certain ions to get through a 90 degree turn and not others. If an ion makes it through the turn it then enters the acceleration tube. This is what shoots the ions at high speeds towards the wafer.

One important concept associated with ion implantation is ion implant energy. The ion implant energy is what controls the ion depth. Certain devices have required junction depths they need the ions to stop at. By increasing or decreasing the ion energy, you can control how far into a material the ions travel. Mass also plays a role in this because a larger ion will not travel as far into a material as a lighter ion. This is what is demonstrated in the ion implantation experiment. The height that the balls are dropped from represents the implant energy of an ion and the size of the ball represents the size of the ion.

