

Semiconductor materials are the heart of computers. The materials in this class conduct under certain conditions and not others. Through doping (the substitution of atoms), control of conduction can be achieved in localized spots on a computer chip. This ultimately leads to the ability to route and store electrons, the foundation of binary logic and the extensive functions of computers. Almost all devices are based on Silicon, which is also the material studied in this experiment.



▲ Energy of electrons



The band structure of semiconductors is such that the outermost band of electrons, the valence band, is completely full. If a voltage is applied, there is no conduction of electrons because there are no empty spaces to allow the electrons to move around.

In order for conduction to occur, electrons must be excited to the next highest band, known as the conduction band. The conduction band is normally empty but is separated from the valence band by only a small amount of energy. Valence electrons can surmount this barrier by absorbing a small amount of energy from heat or light. This then creates a free electron in the conduction band and a hole (missing electron) in the valence band.

Doping (replacing Si atoms with atoms of another element) is frequently used instead of temperature to control conductivity



Experiment





Arun Mohan

