Solar Cells

A solar cell is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon.

It is a form of photoelectric cell, defined as a device whose electrical characteristics, such as current, voltage, or resistance, vary when exposed to light. Solar cells are the building blocks of photovoltaic modules, otherwise known as solar panels.

Overview of Solar Cells

Solar cells are described as being photovoltaic irrespective of whether the source is sunlight or an artificial light. They are used as a photodetector (for example infrared detectors), detecting light or other electromagnetic radiation near the visible range, or measuring light intensity.

Solar cells are often bundled together to make larger units called solar modules, themselves coupled into even bigger units known as solar panels.

Just like the cells in a battery, the cells in a solar panel are designed to generate electricity; but where a battery's cells make electricity from chemicals, a solar panel's cells generate power by capturing sunlight instead

How do Solar Cells work?

A solar cell is a sandwich of n-type silicon and p-type silicon . It generates electricity by using sunlight to make electrons hop across the junction between the different flavors of silicon:

1. When sunlight shines on the cell, photons (light particles) bombard the upper surface.
2. The photons (yellow blobs) carry their energy down through the cell.
3. The photons give up their energy to electrons (green blobs) in the lower, p-type layer.
4. The electrons use this energy to jump across the barrier into the upper, n-type layer and escape out into the circuit.
5. Flowing around the circuit, the electrons make the lamp light up.

Types of Solar Cells

There are three types of Solar Cells with each having distinguished features. They are as follows:

1. **First-Generation Solar Cells:** About 90 percent of the world's solar cells are made from wafers of crystalline silicon (abbreviated c-Si), sliced from large ingots, which are grown in super-clean laboratories in a process that can take up to a month to complete. The ingots either take the form of single crystals (monocrystalline or mono-Si) or contain multiple crystals (polycrystalline, multi-Si or poly c-Si).

2. **Second-Generation Solar Cells:** Classic solar cells are relatively thin wafers—usually a fraction of a millimeter deep (about 200 micrometers, 200μm, or so). But they're absolute slabs compared to second-generation cells, popularly known as thin-film solar cells or thin-film photovoltaics which are about 100 times thinner again (several micrometers or millionths of a meter deep). Although most are still made from silicon (a different form known as amorphous silicon, a-Si, in which atoms are arranged randomly instead of precisely ordered in a regular crystalline structure), some are made from other materials, notably cadmium-telluride and copper indium gallium diselenide.
3. **Third-Generation Solar Cells:** The latest technologies combine the best features of first and second generation cells. Like first-generation cells, they promise relatively high efficiencies (30 percent or more). Like second-generation cells, they're more likely to be made from materials other than "simple" silicon, such as amorphous silicon, organic polymers perovskite crystals, and feature multiple junctions.