

Advancements in Photovoltaic Technology

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Solar cells play a major role in building up energy storage solutions throughout the world. There are advancements happening in the development of more efficient panels, more efficient designs and materials for more efficient light absorption etc. Development of cost efficient PVs have provided a path for the installation of solar PV installations at various sectors throughout the world.

Solar Cell Technology: The solar cell technology has moved from Crystalline Silicon cells, thin film technologies to multijunction/tandem solar cells in order to absorb more and broader range of sunlight and then to emerging PV technologies such as Organic cells, Organic tandem cells, Perovskite solar cells, Perovskite based tandem solar cells and Quantum dot cells. Another significant advancement in the solar cell technology is by using Active and Passive solar tracking systems. Solar tracking systems were designed to automatically align the solar panels depending on the sun's position in order to obtain maximum power.

Material Advancements: Various materials were explored by researchers which started from Crystalline Silicon (Monocrystalline, Polycrystalline) to various thin film materials such as Amorphous Silicon, CdS/CdTe, CIS, CIGS, CZTS etc. Various Organic/Polymer and Inorganic materials were researched leading to various generations of solar cells. First generation solar cells focused on the Wafer based silicon solar cells such as monocrystalline and polycrystalline silicon. Second Generation focused on thin film solar cells. Third generation focused on nanocrystal based solar cells, Dye sensitized, polymer and Perovskite solar cells. Development of new materials such as Perovskite can achieve higher efficiencies of solar cells. This material research has led to enhance the absorption in the broader range of sunlight. Some of the materials were researched to provide cost effective solutions in the solar industry. Availability of materials with absorption in different range of sunlight had led to the development of tandem and multi-junction solar cells from single junction solar cells which have improved the overall absorption of the sunlight.

Solar Panels: Nowadays, solar panels are becoming cheaper, durable and more efficient. Solar Power is generated through ground mounted solar panels and roof top solar panels. Bifacial solar panels are one of the important advancements in solar panels where it can capture sunlight in both front and rear surfaces. These bifacial solar panels are particularly employed in zones having reflective surfaces where it absorbs the reflected sunlight as well. Combined with the technology and material advancements, flexible solar panels which are much lighter than the conventional solar panels make it suitable for self powered electronic products.

Applications: PV systems are employed in wide range of applications in various sectors such as power supplies at homes, battery charging, street lighting, satellite power systems, hybrid vehicles,

transportation, military space, refrigerate medical supplies, power source for irrigation etc. Also, solar powered gadgets are also becoming popular and prevalent. Apart from its fixed usage, solar panels are being integrated into transportation like solar powered vehicles etc. Solar photovoltaic technology is employed in wearable sensors for monitoring the health in Medical sector. With the technology advancement and novel materials research, Solar Photovoltaic has made a greater progress in various sectors from home applications to wearable electronic devices.

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