





#### **PV** solar cells

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1

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1

# Solar Cells and their working principle

### **Photovoltaic Effect:**





# Different Types of PV solar cells





# Silicon PV Cells/Single Junction

#### Single Junction silicon solar cell





# Silicon PV Cells/Single Junction

### **Advantages**

High efficiency

Abundancy of Silicon

**Disadvantages** 

*Environmental impact of manufacturing* 

Disposal/recycling is limited

Safety of Silicon

High Cost



# Silicon PV Cells/Second Generation



Lower cost in comparison to first generation

Lower efficiency in comparison to first generation



# Silicon PV Cells/Third Generation

Third Generation PV Cells Tandem Solar Cell

Nanostructured Solar Cell

Multi Junction solar Cell





**Tandem Solar Cell** 



#### **Multi Junction Solar Cell**



# Non-Silicon PV Cells/Liquid Dye-Sensitized





Advantages	<b>Disadvantages</b>
High efficiency	Low stability
	Encapsulation
Low Cost	Solvent Leakage



# Non-Silicon PV Cells/Solid-State Dye-Sensitized





## Non-Silicon PV Cells/Quantum Dot

#### Uses quantum dots instead of light absorbing organic dyes





## Non-Silicon PV Cells/Quantum Dot

### **Advantages**

High efficiency

Mass and area saving

Low Cost

**Disadvantages** 

Highly toxic and needs stable shell

Increased degradation in aqueous and UV conditions

Altered optical properties of the shell



## Non-Silicon PV Cells/Organic Polymer solar cell

Single Layer

Organic polymer solar Cells

Bilayer Heterojunction

Bulk Heterojunction



**Bilayer Structure** 

**Bulk Heterojunction** 

Acceptor-fullerene material Donor-polymer material



# Non-Silicon PV Cells/Organic Polymer solar cell

#### **Advantages**

*lightweight compared to siliconbased devices* 

*The material is flexible and customizable at molecular level* 

*lower potential for negative environmental impact* 

### **Disadvantages**

Low efficiency compared to siliconbased devices

unstable toward photochemical degradation

The lifetime of plastic photovoltaic currently doesn't come anywhere near that of silicon solar panels

Polymer solar cells also suffer from environmental degradation owing the lack of effective protective coatings



## Non-Silicon PV/ Perovskite solar cell

Perovskite solar cell Perovskite-Sensitized solar cell

Thin-Film perovskite solar cell





## Non-Silicon PV/ Perovskite solar cell

#### **Advantages**

#### Highly efficient

#### Low-cost manufacturing process

Suitable for all sorts of solar power production

#### **Disadvantages**

This material generates a toxic lead

*The material's commercialization has not yet started* 

It wears away when in contact with light, heat, moisture, and oxygen after some months of use



## Non-Silicon PV/ Perovskite solar cell

### Difference between Perovskite and Silicon Solar Cells:

Silicon solar cells have existed for years, but perovskite is a new invention.

The efficiency of monocrystalline silicon panels is 19% to 20%. The efficiency of Perovskite panels is approximately 30%

The silicon cells' service life is 25-30 years, whereas, for the other, it is 2.5 years

The light absorption potential of silicon cells is 1100 nm. On the other hand, the perovskite solar cells' absorption potential is 850 nm

The price of the ones is less than the crystalline silicon cell



Challenges ...





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