



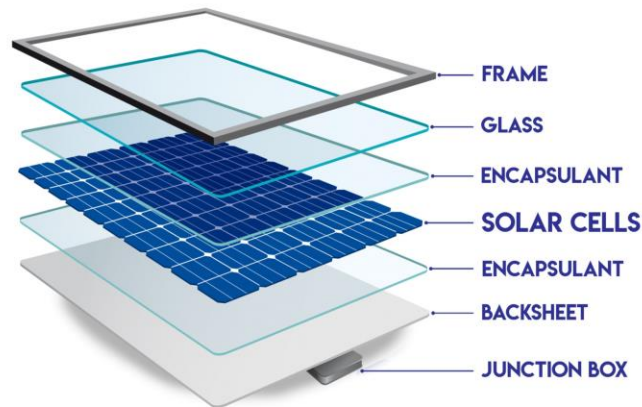
HOW SOLAR PANELS WORK

Ayberk Ayhan

What is a solar panel?

Solar panels are collection of solar cells which are devices that convert light into electricity. They are called "solar" panels because the Sun is called Sol by astronomers and most of the time, it is the most powerful source of light available. Also some scientists call them photovoltaics which means "light-electricity".

COMPONENTS OF A SOLAR PANEL:



TYPES OF SOLAR CELLS:

Monocrystalline:

- Produced from one large silicon block, consisting of single type of crystal, in the form of silicon wafers.
- Most efficient form of solar cells, but also labor-intensive, therefore, more expensive to manufacture.

Polycrystalline:

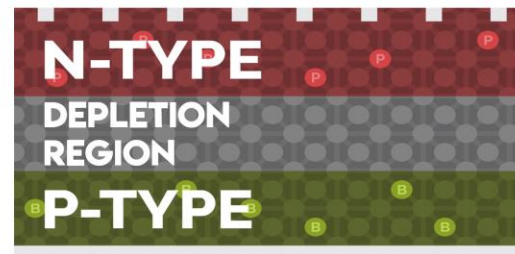
- They are produced by melting multiple silicon crystals together and re-fused into the panel itself.
- Less efficient from monocrystalline, but easier to manufacture, therefore, has a lower price point.

Amorphous:

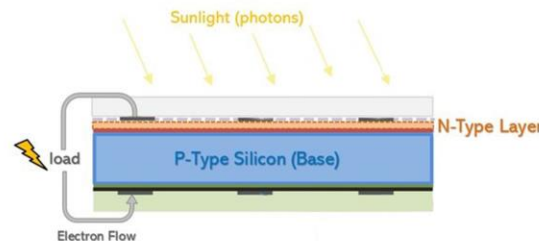
- They are non-crystalline and attached to a substrate like plastic, glass or metal.
- Thin and flexible unlike in standard panels.
- Least efficient form of solar cells.

HOW SOLAR CELLS WORK:

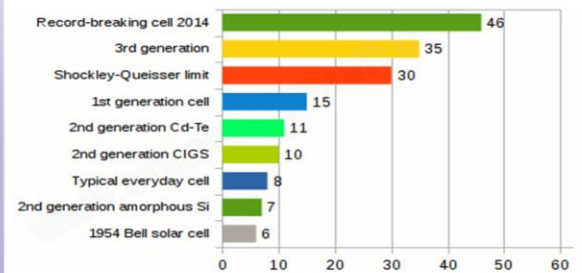
All crystalline solar cells are made using a very thin wafer of silicon with the two main types being p-type and n-type. These are made when the silicon is 'doped' with specific elements to create a negative (n-type) or positive (p-type) charge.



As sunlight hits the solar cell, it excites the electrons in the depletion region. Excited electrons migrate towards n-type silicon, therefore developing a potential difference between n-type and p-type. When these two types are connected together with cable, electrons will migrate from n-type to positively charged p-type, creating a direct current.



SOLUTIONS TO EFFICIENCY PROBLEMS:



- N-type panels
- Solar Thermophotovoltaic Device

QUANTUM DOT SOLAR CELLS:

Quantum dot solar cell is a pre-commercial technology that uses a matrix of finely tuned crystals instead of silicon wafers. The ability to tune them to specific segments of the light spectrum means that cell can catch light in wider spectrum, therefore, can reach efficiencies as high as 65 percent.

REFERENCES

Richardson, L. (2019, November 6). How Are Solar Panels Made? Parts of a Solar Panel: EnergySage. Retrieved from <https://news.energysage.com/what-are-solar-panels-made-of-list-of-solar-pv-materials/>

David DeFranza (2018, June 28). Understanding Quantum Photovoltaics. Retrieved from <https://science.howstuffworks.com/environmental/energy/quantum-photovoltaics.htm>

Woodford, C. (2018, May 12). How do solar cells work? Retrieved from <https://www.explainthatstuff.com/solarcells.html>

Svarc, J. (2018, August 20). Solar Panel Construction. Retrieved from <https://www.cleanenergyreviews.info/blog/solar-panel-components-construction>