

The Future of Solar Energy with Organic Solar Cells!

What is clean energy?

Clean energy is energy that comes from renewable sources that do not pollute the atmosphere when used. Solar energy from the sun, wind energy, and energy from flowing water are all sources of clean, renewable energy.



Solar farm



Wind farm



Hydroelectric dam

What are solar cells?

Solar cells are devices that take the energy from the sun and turn it into electrical energy to power our world. If you have ever seen a blue-colored solar cell, you've likely seen a solar cell made of silicon crystals. Silicon-based solar cells allow awesome harvesting of clean energy! However, they are also expensive to make and very brittle which means they are easily broken and challenging to repair.



This solar cell is taking energy from the sun to power a lightbulb!

What is a semiconductor?

A semiconductor is a material that can conduct electricity. An example of a semiconducting material is silicon. Regular conductors are materials like metal which conduct electricity really well. Insulators are materials like wood that do not conduct electricity well. The "semi" part of semiconductors means these materials can conduct electricity better than an insulator but not as good as a conductor. Semiconductors have the unique ability to absorb energy from light and transfer it into electrical energy which we can use to power the lights in our homes, schools, etc.

least
conductive



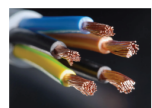
Wood is an example of an insulator

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Silicon is an example of a semiconductor

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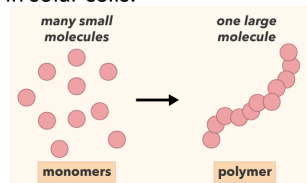
Copper wire is an example of a conductor

most
conductive

What are polymers?

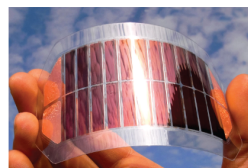
Any material which contains a significant amount of carbon molecules can be called an organic material. Polymers are a type of organic material made up of repeating units called monomers which react with each other to form a polymer. Polymers can have lots of different properties depending on their monomers. Bulletproof vests, contact lenses, and raincoats are all made out of different kinds of polymers! We can even alter our monomers to make semiconducting polymers that can be used in solar cells!

In this case, an organic material simply means the molecules in the material contain a lot of the element carbon.



The Future of Solar Cells!

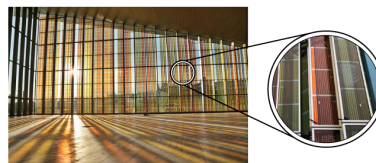
Scientists are currently super interested in making semiconducting polymers to use in solar cells! These organic solar cells are cheaper to make, very flexible, and can be made almost transparent. This means they can be installed in windows, on cars, or in other places where silicon-based solar cells could easily break or would block out light. However, organic solar cells must be further optimized to more efficiently change solar energy into electrical energy. Scientists are currently working to improve the efficiency of organic solar cells so they can become widely available for everyday use. Regardless, organic solar cells allow easier, cheaper access to clean solar energy which supports our environment. Additionally, even though organic solar cells aren't yet widely available, scientists around the world have already incorporated organic solar cells into windows and "smart" sunglasses. Just imagine what could be next!



Flexible organic solar cell



Smart sunglasses powered by organic solar cells



Convention center with organic solar cell window display

Discussion Questions

1. What do solar cells do?
2. What makes organic solar cells different from silicon-based solar cells?
3. What are other creative ways flexible and transparent solar cells could be incorporated into the world around us?
4. Organic solar cells can convert sunlight into electricity even when vertical to the sun which allows them to be used in windows, unlike silicon-based solar cells. Do you think there are more roofs or windows in the world? Does it change depending on where you live?

Additional Resources

You can find a demonstrational video highlighting the physical differences between inorganic and organic solar cells here:

Sources: <https://theconversation.com/curious-kids-how-do-solar-panels-work-123515>, <https://phys.org/news/2017-08-glasses-power-flexible-solar-cells.html>, <https://www.solaronix.com/news/inauguration-of-the-swisstech-convention-center/>, <https://www.esquiremag.ph/culture/lifestyle/james-dyson-award-carvey-maigue-a00297-20201116>, <https://www.energy.gov/eere/solar/solar-photovoltaic-cell-basics#:~:text=When%20light%20shines%20on%20a,good%20conductor%20like%20a%20metal>