New Material Able To Absorb Full Light Spectrum

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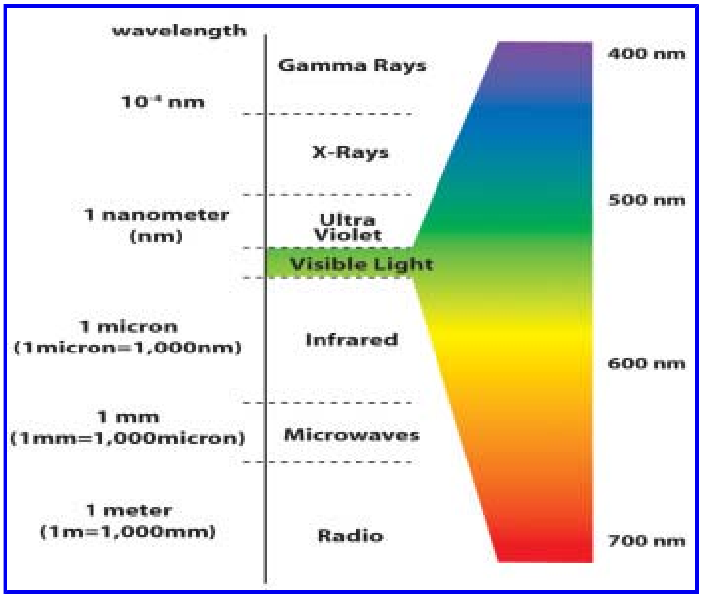
[1] 

Ohio State University Chemists have produced a breakthrough material that can absorb the full spectrum of sunlight and make the electrons generated easier to capture.

The material is an amalgamation of electrically conductive plastic and metals like molybdenum and titanium. It is the first such material able to capture the full solar spectrum. The solar panels in use today are only able to harness a small portion of the energy in sunlight.

The material is still in its infancy and is far from commercialization, but it is another example of the vast possibilities of capturing and using the sun's energy. Even with the economic downturn, and the lack of extension of credit in many sectors, the arena of green energy continues to raise funding and attract solid investments.

If this new material can be coupled with cutting edge battery technology, it has the potential to change the way we produce and consume energy. Individual homes could be rigged with their own energy systems and virtually wipe out the need for grid power. With the potential of this technology coupled with nanotechnology in batteries the viability of an oil free nation is within reach in the next decade.

> The material generates electricity just like other solar cell materials do: light energizes the atoms of the material, and some of the electrons in those atoms are knocked loose.
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> Ideally, the electrons flow out of the device as electrical current, but this is where most solar cells run into trouble. The electrons only stay loose for a tiny fraction of a second before they sink back into the atoms from which they came. The electrons must be captured during the short time they are free, and this task, called charge separation, is difficult.
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> In the new hybrid material, electrons remain free much longer than ever before.
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> To design the hybrid material, the chemists explored different molecular configurations on a computer at the Ohio Supercomputer Center. Then, with colleagues at National Taiwan University, they synthesized molecules of the new material in a liquid solution, measured the frequencies of light the molecules absorbed, and also measured the length of time that excited electrons remained free in the molecules.
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> They saw something very unusual. The molecules didn't just fluoresce as some solar cell

materials do. They phosphoresced as well. Both luminous effects are caused by a material absorbing and emitting energy, but phosphorescence lasts much longer.

To their surprise, the chemists found that the new material was emitting electrons in two different energy states — one called a singlet state, and the other a triplet state. Both energy states are useful for solar cell applications, and the triplet state lasts much longer than the singlet state.

Electrons in the singlet state stayed free for up to 12 picoseconds, or trillionths of a second — not unusual compared to some solar cell materials. But electrons in the triplet state stayed free 7 million times longer — up to 83 microseconds, or millionths of a second.

When they deposited the molecules in a thin film, similar to how they might be arranged in an actual solar cell, the triplet states lasted even longer: 200 microseconds.

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