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Solar material absorbs entire spectrum

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PORTLAND, Ore. — Current solar materials must be chosen to match a specific wavelength of sunlight, but a new hybrid inorganic/organic material could usher in solar cells that absorb all solar wavelengths.

The new polymer could also enable much more efficient charge separation since electrons dislodged by light in the material remain free much longer than in conventional solar cells.

The inorganic/organic hybrid polymer material can be made into polymer blends that can "absorb essentially across the entire solar spectrum--they go from about 300 nanometers down to about 10,000 nanometers," said professor Malcolm Chisholm of Ohio State University.

Solar materials work by using incident light to boost the energy of electrons, thereby separating then from the hull of atoms in the material. They can then be harvested to generate electricity.

However, separated electrons fall back into their host atoms if not collected quickly. Usually, solar materials either fluoresce (called singlet emisson) or phosphoresce (triplet emission). The new hybrid material does both, further increasing potential efficiency.

"The materials we have made show both singlet and triplet emissions," said Chisholm. "The singlet state lasts a relatively long time, in the region of about 10 pico seconds; the triplet lasts a lot longer--up to a 100 or so microseconds, which should be good for separating the electrons and the hull."

The new material was designed at the Ohio Supercomputer Center and synthesized at the National Taiwan University. Funding was provided by the National Science Foundation and Ohio State's Institute for Materials Research.

A detailed description of the new material was recently published in the Proceedings of the National Academy of Sciences.