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Hybrid solar cells via UV-polymerization of polymer precursor (IN-07-053)

New fabrication method results in high-performing solar cells

The Invention

A method to create improved hybrid solar cells through the ultraviolet (UV) polymerization of a polymer precursor.

While sunlight is plentiful and carbon-neutral, and because the technology for converting it to electric power is complicated and expensive, solar energy currently sees only limited use. Hybrid solar cells—devices incorporating both organic and inorganic materials—may serve as a promising alternative for traditional silicon-based solar cells. Thus far, however, the processes for building them have presented limitations.

One approach for making inexpensive hybrid photovoltaic (PV) cells involves filling nanostructured titanium dioxide films with solid organic hole conductors such as conjugated polymers. These compounds can function as light-absorbing species and inject electrons into the conduction band of the n-type semiconductor, while at the same time conducting the holes to the cathode. Several types of conjugated polymers can be used.

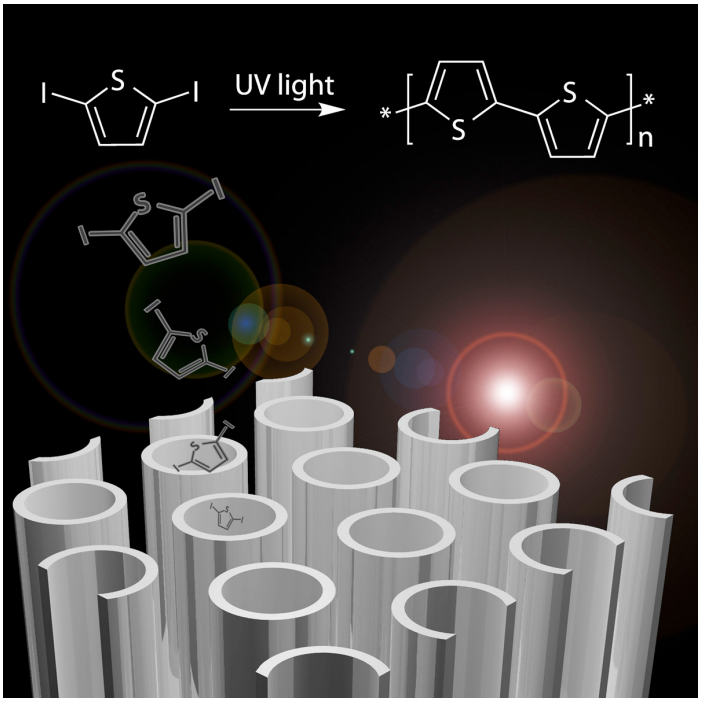
Argonne has fabricated a hybrid PV cell by immersing a nanotubular TiO_2 substrate in a monomer precursor solution and then irradiating the substrate with UV light to polymerize the precursor. The resulting cell yields a photocurrent density substantially higher than that achieved by filling with pre-polymerized material. Depositing polymer into densely ordered nanotube or nanorod arrays creates high-performing solar cells.

Benefits

- Cost-effective fabrication method
- Relatively simple to execute
- Produces high-performing solar cells

Applications and Industries

- Small and large electronics products
- Military equipment
- Mobile phones and chargers



Polymer precursors easily infiltrate electron-accepting nanotubes and are then polymerized in situ using ultraviolet light.

Developmental Stage

Ready for commercialization

Availability

Available for licensing

Argonne Invention Number

IN-07-053

Patent Information

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