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Nanotechnology and PV Cells

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Abstract-Nanotechnology have numerous possibilities in future.Manufacture of lighter, stronger, and programmable materials that require less energy to produce than conventional materials can be made possible by nanotechnology.When we talk about PV Cells,current solar power technology has little chance to compete with fossil fuels or large electric grids.They are not much efficient and too expensive for large scale electricity manufacturing.Nanotechnology is the way by which PV Cells can be made more efficient and budget friendly. Wide-bandgap nano materials prepared from II–VI and III–V elements have potential applications in emerging energy. They can be prepared in different geometric shapes including nanowires (NWs) and nanobelts.

Keywords: Nanotechnology, nano plastics,nanowires and nanotubes.
Introduction:First,I would like to examine the current solar cell technologies available and then look at their drawbacks. Further,I will explore the research field of nano solar cells, and the science behind them. Finally, I will consider the implication of these technologies on coming future.
Current Solar Cell Technologies: Conventional solar cells that we are using today are photovoltaic cells.These cells simply made up of semiconducting materials such as silicon p-n junction is the main key in solar cells.Energy can be harnessed easily by the photovoltaics. Photovoltaics is a straight forward and rich strategy for trapping the sunlight.

Solar cells convert the rays of sunlight into electricity.It is possible only by the creation of electron-hole pairs when the material absorbs photons corresponding to an energy greater or equal to its energy gap .

When sunlight hits the cells, they absorb energy through photons. This absorbed energy hits electrons in the silicon and allows them to flow. They add different impurities to the silicon such as phosphorus or boron, an electric field can be established.Here electric field allows only electrons to flow in one direction,so it acts as a diode. This is the phenomenon of producing electricity through solar cells. Why nanotechnology photovoltaic cells over classic photovoltaic cells? Classic photovoltaic cells can achieve efficiencies around ten percent and they are expensive to manufacture which we cannot avoid with silicon. This is because the incoming photons should have the appropriate energy. If the photon has less energy than the band gap energy then it will pass through. If it has more energy than the band gap extra energy will be wasted. Loss of around 70 percent of the energy incident on the cell. Nanotechnology can be proved boon in this field. ◦ Nanoplastics:Solar panels made with titanium nanoplastics are thin and flexible. TiO2 nanoparticles absorb, photons with energies equal to or higher than its band gap (>3.0 eV), electrons are shifted from the valence band into the unoccupied conduction band, which shifts excited electrons in the conduction band and positive holes in the valence band. These charge carriers further reunite,converting the input energy as heat,or react with electron donors or acceptors adsorbed on the surface of the photo catalyst.

Titanium nanomaterials have been extensively studied in the past few years. TiO2 can convert solar energy into electrical energy for solar cell applications. Due to their properties, nanomaterials have vast applications, including paint, toothpaste, UV protection, photo catalysis, photovoltaic, sensing, electrochromic and photochromic.

Nano solar technology is effective in indirect lighting situations and enables us to produce power almost all day long, even on a vertical surface. The Total Energy Collected from Plastic performs good other solar panels, and gives solar energy and design freedom for architectures and glass manufacturers.

Plastic have both options opaque and semi-transparent solar panels. As they are thin and flexible, they can be moulded to the curves and contours of your designs. This means we are now not limited to installing rigid, black, silicon solar panels.With nano plastics we can create beautiful solar powered buildings.

Carbon nanotubes: These have simple fabrication process, low production cost, and high efficiency.So,production of dye-sensitized solar cells (DSSCs)is beneficial.It is made by semiconductor which is formed between a photo-sensitized anode and an electrolyte, a Titanium dioxide nanoparticles which is widely used as a working electrode for DSSCs because they provide high efficiency, more than any other metal.

The transport of electrons across the particle pool has been a problem in achieving higher photoconversion efficiency in nanostructured electrodes. As electrons experience many small boundaries during the transit and experience a random path and the probability of their recombination with oxidized sensitizer is very high. Various CNT based nanostructures can be used to direct the flow of photogenerated electrons and assist in charge injection and extraction.For transporting the electron to the collecting electrode surface in a DSSC, we utilize CNT networks to support the anchor light harvesting semiconductor particles.

Nanowires:These are known as quantum wires.Nanowires are thin wires having a diameter less than or equal to 100 nano-meters.There are metallic,semiconducting and insulating nanowires.Due to their small size they are good conductors because electrons can easily pass through them.Fabrication of nanowire solar cells using the semiconductors cadmium sulphide for the core and copper sulphide for the shell are inexpensive and easy-to-make nanowire solar cells having open-circuit voltage and fill factor values superior to conventional solar cells we are using now. Also the open-circuit voltage and fill factor determine the maximum energy that a solar cell

can produce. These nanowires also demonstrated an energy conversion efficiency of 5.4-percent, which is comparable to planar solar cells.

Nanotechnology Photo Voltaic Cells;Basically,plastic is made using nanoscale titanium particles which are coated in photovoltaic dyes and generate electricity when they absorb light. Only 8 percent efficiency is achieved by fully functional solar cells.The manufacturing cost of current solar cells is one of the major drawbacks,nano technology could have ability to solve this problem. Although nanotechnology is only capable of supplying sufficient energy for low power devices but its implications onsociety would still be tremendous. It would help preserve the environment,provide electricity for rural areas, and have a wide list of commercial applications.

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