Application of Nanotechnology for Harnessing the Solar Energy

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***Abstract* --** At the size of physical, chemical and biological properties of nano-materials differ in fundamental and valuable properties of individual atoms and much matter. The properties in nano, one can create a wide range of potential applications for nano-materials discovery. One of these applications includes the creation of revolutionary potential energy.These nanotechnology are the sources of energy, including hydrogen, geothermal energy, unconventional natural gas nuclear fission and solar energy, while hydrogen is energy. We know hydrogen gas is an alternative energy source, while hydrogen gas is frustrated by gaps in technology and can't be stored in any material long time. The applications of nano-technology help us to make solar energy more economically. Nanotechnology deals about nano-science of photovoltaic cells are used to improve the efficiency for creating efficient systems for less cost. It can store the energy system on a large scale. Also it is used in DC-DC power converters, fuel cells, nano computers and components for high temperature applications. One should know it is the erasing of carbon footprints from atmosphere air as well as from water filtration, waste and water treatment, hazardous materials disposal, in-building environmental systems clean. So nano technology can make the future sustainable. In this paper an attempt has been made to bring out an idea and overview regarding the use of nano technology in the field of producing electricity from solar energy.

***Key Words*: Nano technology nano materials solar energy sustainable energy source**

I. INTRODUCTION:

Nanotechnology is the field of applied science focused on the design, synthesis, characterization and application of materials and devices on nono-scale. Nano size or nano means one billionth of a meter i.e., 1nm is equal to 1/1,000,000,000 of meter. Nano-materials is the materials that has structured components with at least one dimensions and lies than 100 nm scale range is known as nanomaterials.

Fibrication of Nanomaterials:

In attrition, micro or macro scale particles are ground in a ball-mill or a plantry other size reducing mechanism

Materials referred to as “nanomaterials” generally fall into two categories; fullerences and inorganic nanoparticles, CNTs (carbon nanotubes) and fullerences both come under carbon naomaterials.

New nanomaterials and properties of Nano-technology:

- Quantum Dots (QD): Quantum dots is a semiconductor that exhibits quantum confinement properties in all three dimensions.

The size is in the range of 1-10nm. They may be metallic, for example gold, or chalcogenide based. Eg: cadmium selenide, lead selenide or cadmium sulphide.

Present application:

- Qd have high potential for photovoltaic application. They can absorb photons from solar radiation and release electrons to generate electricity.
- Used to manufacture extremely efficient thin-flim PVs.
- Used in transistors, LEDs and diode layer as agents for medical imaging.

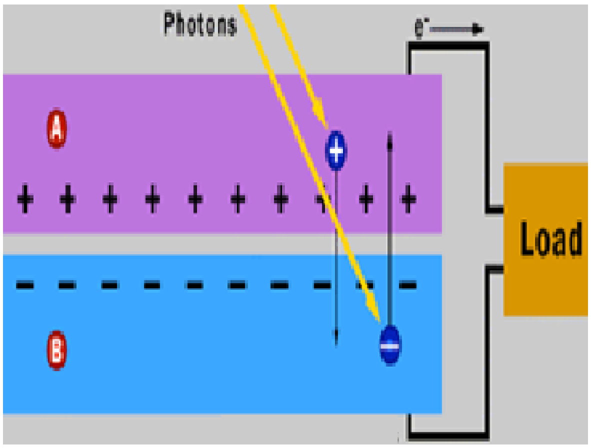
Future application:

- For new generation of quantum computers that will render today’s computer and credit card technology.
- For cellular imaging in our body.
- For LED displays.

Nanotechnology is the manipulation of matter on an atomic and molecular scale. Conventional solar cells are called photovoltaiccells. These cells are made out of semiconducting material, usually silicon. When light hits the cells, they absorb energy though photons. This absorbed energy knocks outer electrons in the silicon, allowing them to flow. By adding different purities to the silicon such as phosphorus or boron, an electric field can be established. This electric field acts as a diode, because it only allows electrons to flow in one direction. The conventional solar cells have two main drawbacks: they can only achieve efficiencies around ten percent and they are expensive to manufacture. Inefficiency is almost unavoidable with siliconcells. This is because the incoming photons, of light, must have the right energy, called the bandgap energy, to knock out an electron. If thephoton has less energy than the band gap energythen it will pass through. If it has more energy it will wasted as heat. So, nanotechnology application includes the creation of revolutionary potential energy.

Generation of electricity from solar energy by the application of nanotechnology.

II. Nano technology for powerful solar energy:



Now-a-days around 25% mass produced solar cells are increased and it is the reduction of manufacturing cost. Chemists at the University of California, Berkley, have discovered a way to make cheap plastic solar cells that could be painted on almost any surface.

Fig: conversion of light energy into electrical energy or electricity.

These new plastic solar cells achieve efficiency of only 1.7 percent ; so, that nanotechnology has potential to do a lot better and clear path for us to take to make this perform much better. The conversion efficiency of dye-sensitized solar cells (DSSCs) has currently been improved above 11 percent and in low cost has been purposed as alternative to silicon based photovoltaic cells. We know areas of physics such as nano electronics, nano mechanics, nano photonics have involved during the last few decades to provide a basic scientific foundation of nano technology. So that nano technology rise to many materials and nano materials with fast ion transport are related also to nano ionics and nano electrons.

III. Dye-sensitized nanocyrstalline solar cell(DSC):

The dye-sensitized nano crystalline solar cell is used for original state conduction of power contains dye subsequently containing redox system. If we sensitized DSC as heterojunction usually with an inorganic wide band gap nano crystalline semiconductor of n-type polarity as electron acceptor and charge neutrality being restored by a hole delivered by the semiconductor, inorganic or organic of p-type polarity. Through dye-sensitized nano crystalline solar cell is working in less time and with less loss of energy we are working more time there is more without side effect. Hence we can use DSC power generation.

Present DSC research and development:-

Upon excitation it should inject electron into the solid with a quantum yield of unity. The energy level of the excited state should be well matched to the lower band of the conduction band to minimize energy losses during electron transfer. Its potential should be sufficient that it can be generated electron donation from the redox electrolyte or hole conductor. Finally it should be stable enough to sustain about 20 years.

Harnessing the sun with nanotechnology:-

The solar cells could be used to generate electricity for buildings and harness energy for portable poser applications. More importantly, they are environmentally friendly energy alternative fossil fuels. The potential uses from the consumer level to industry, great excite the research team. In fact, solar energy cells may hold the key to developing sustainable methods to fuel our cars.

So, the rays of combining hydrogen from solar power with biomass to create greater quantities of clean burning liquid fuel. In this researches by Fabio ribeiro, a professor of chemical engineering and nick delgass, the Mexican spencer Nichols, professor of chemical engineering. The method could yield enough liquid fuel for the entire U.S. transportation sector using the sustainably available annual waste biomass in the country.

The key to utilizing solar energy, according to Hillhouse, is to make it economical for the consumer. Up to this point, solar cells have been made through energy-intensive processes that involve ultra-high vacuum and high temperature. The process is slow, expensive, and restricts the range of possible substrates. The solar group's ink process uses solution-based chemistry to create nanocrystals that may then be consolidated to yield a thin film that is the active component of the solar cell. It is a cheaper and more efficient approach. This is still the tip of the iceberg, though.

IV. Nanotechnology and energy for our future:-

Nanotechnology is poised to play a significant role in the development of clean, less expensive energy. The potential of nanotechnology for solving some of today's greatest energy challenges is vast. Nanotechnology refers broadly to a field of applied science and technology whose unifying theme is the control of matter on the molecular level in scales smaller than one micrometer, normally 1 to 100 nanometers, and the fabrication of devices within that size range. For scale, a single virus particle is about 100 nanometers in width. Encompassing nanoscale science, engineering and technology, nanotechnology involves imaging, measuring, modeling, and manipulating matter at this length scale.

At this size dimension, the physical, chemical, and biological properties of materials differ in fundamental and valuable ways from the properties of individual atoms, molecules, or bulk matter. The properties displayed at the nanoscale create a host of potential innovative uses for nanomaterials. One of these uses includes the creation of exciting and revolutionary energy applications. These potential nanoscale energy applications apply to a host of different sources of energy, including hydrogen, geothermal, unconventional natural gas, fission, and solar energy.

While hydrogen is an energy storage medium, it is not a primary energy source. Therefore, full realization of hydrogen as an alternative energy source is frustrated by gaps in technology, which do not precipitate the efficient and cost-effective storage and transport of hydrogen. Nanoscience provides new approaches to basic questions about the interaction of hydrogen with materials to enable the efficient and cost-effective storage and transport of hydrogen.

Applying nanotechnology to geothermal energy increases the opportunities to develop geothermal resources by enhancing thermal conductivity or aiding in the development of noncorrosive materials that could be used for geothermal energy production.

The recovery of unconventional sources of natural gas is yet another potential application of nanotechnology. Unconventional sources of natural gas include tight sandstones, shale gas, and coal bed methane. Nanotechnology applications may prove useful in accessing or exploiting these unconventional natural gas sources. For instance, nanocatalysts and nanoscale membranes may prove useful in assisting in Gas to Liquids production. Furthermore, certain nanostructured materials may assist in compressed natural gas transport.

Nanotechnology may also prove useful in solving the waste problems of the nuclear energy industry. For instance, certain nano-engineered barriers may prove useful in preventing the migration of or containing nuclear waste products.

Nanotechnology applications may assist in making solar energy more economical. Nanoscience can be utilized to improve the efficiency of photovoltaic cells, creating cost-efficient conversion systems, effective solar power storage systems or even the generation of solar energy on a larger scale. For instance, “nanopatterning” can artificially change the optical properties of materials to allow light to be trapped in solar cells.

Nanotechnology might someday allow for more powerful, more efficient and less expensive energy generation, storage transmission and distribution. Nanotechnology is being used to optimize production from existing energy sources and to exploit new sources such as geothermal, liquefied natural gas, nuclear and solar energy. Nanotechnology is also improving and opening new possibilities for the transmission and storage of energy, especially electricity and possibly hydrogen in the future.

Nanotechnologies have the potential to reduce energy consumption by making it possible to manufacture lighter and/or more energy efficient cards and appliances. Even though nanotechnology is a relatively young field, the potential for future nanotechnology applications within the energy industry could turn out to be one of the most important technological developments of our time.

V. CONCLUSION:

From this nanotechnology for producing powerful solar energy one can create many advanced techniques in every sector like in medical, mechanical and industries. So that it can store energy for conversion more amount work. We know any technology is reduced CO_2 but while using nanotechnology there is no pollution in atmosphere as water treatment. It can be used to make solar energy of photovoltalic cells in the dye-sensitized through nano-crystalline electrochemical photovoltaic system become standard devices for the conversion of solar energy into electricity. Recent developments in the area of sensitizers for these devices have lead to dyes which absorb across the visible spectrum to higher efficiencies. The development of a solid-state hetero-junction keeps additional potential for contradiction and simplification of the manufacturing of dye solar cells.

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