International Journal of Allied Practice, Research and Review
Website: www.ijaprr.com (ISSN 2350-1294)

Hot Planet Energy: A Comparative Study of Various Solar Cells and their Analysis

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Abstract – Energy can neither be created nor can be destroyed is a very famous phrase to enlighten the Energy professionals and researches, so when we look around us a chunk of energy can be found just above our head, which is giving life to all living things. Sun light contains a huge amount of energy source fulfilling the demands of an individual. In the recent past the demand of energy increases in every phase of life from solar cell to intelligent robots. A report of United States Department of Energy suggested that demand of energy will be tripled by the end of current century. To address and resolve the demand of energy it is a must to utilize and recycle more energy from the hot planet. This paper addresses the demand of energy in various phases of life, do the analytical and comparative study to improve silicon solar cell, zinc oxide coating solar cell and polychromate solar cell, which is used to improve the efficiency of absorbing solar energy. As a conclusion it is observed that polychromate solar cell has an extra edge on the above two.

Keywords: Solar Cell; Energy; Zinc Oxide; Polychromate solar cell

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I. INTRODUCTION

The radiant energy which produced from sun is known as solar energy. This energy itself produced in the sun .when the hydrogen atom in the sun combined to form the helium then due to nuclear fusion, energy generated. This generated energy is known as solar energy. Due to the high pressure and temperature during nuclear fusion four hydrogen nuclear fuses became one helium atom [1].

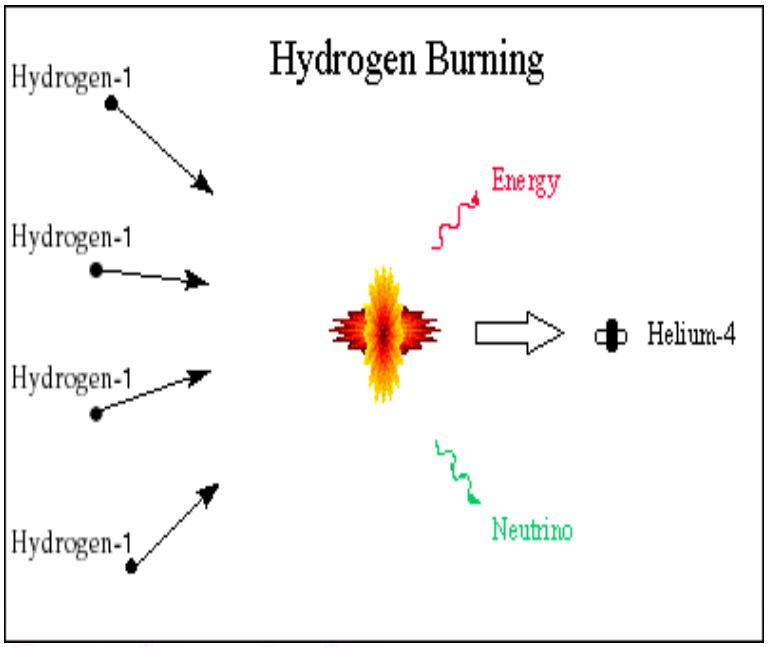

Figure 1 nuclear fusion

This one helium atom contains less mass. Some matter has been losted during nuclear fusion. The lost matter is released into space as radiant energy [1]. The device which used to convert this radiant energy into electricity by photovoltaic effect is known as solar cell .In other ways we says that the device which capture energy from sun light is known as solar cell .

The performance of solar cell depends on how much amount of sun light absorbs and converts into electricity. This shows the efficiency of solar cell. There are unlimited amount of energy which have great potential, despite of it fractional amount of solar energy utilize to full fill the demand of energy .The reason of it may be limited resources and instrument. There is another important reason, due to which the efficiency of solar energy minimizes. When the bundle of light, known as photon strike on the layer material of solar cell then electric charge generate. We know sun light have different wave length. It converted from ultraviolet to visible and from visible to infrared so it has many wave lengths. Due to this the conventional solar cells have the capability to absorbed the narrow range wave length very efficiently .so other wave length which not be absorbed has been waste.

In a past various research have work on solar cell Masfumi yamaguchi emphasis is on high-efficiency single-junction GaAs cells, radiation-resistant InP solar cells, thin-film GaAs-on-Si cells and super high efficiency III-V compound-based tandem solar cells the research and development of thin-film technologies and tandem cells for super-high efficiency and low-cost cells are necessary[2]. Stephan Abermann explain CZTS based solar cell technology which is currently maybe the most promising approach in order to meet these requirements in the near future[3]. Fengyou Wang at el explain Boron doped nanocrystalline silicon/amorphous silicon hybrid thin films were deposited by radio frequency plasma enhanced chemical vapor deposition (RF-PECVD) to improve the performance of silicon heterojunction (SHJ) solar cells[4], Yuki Nishi at el explain Achieving higher efficiency solar cells requires that the surface of Cu2O sheets always be stabilized or treated using a low-damage deposition

technique at a low deposition temperature [5], Sea-Fue Wang at el present work mainly deals with the development of nitrogen doped diamond like carbon (n-type DLC)thin films as counter electrode (CE) in place of platinum that is commonly used as a counter electrode and catalyst in the dye sensitized solar cell (DSSC) design[6]. Y.E.Romanyuk et el review describes a specific group of non-vacuum methods for depositing kesterite solar cell absorbers, which we refer to as direct solution coating. [7]

II. VARIOUS SOLAR CELLS

Silicon Solar Cell- The atom of silicon has 14 electrons. These electrons arrange in 3 different shells in which first two shells hold two and eight electron respectively. The outer shell is partial fill with just four electrons. It's very important to explain that pure crystalline silicon is the poor electricity conductor because it does not have free electron to move. Due to this some impurities added in silicon crystal like phosphorous. It has 5 electrons in its outer shell .it still bonds with its silicon atom. So if all four electrons combined to make crystalline structure 1 electron is free to move. It is a positive point for conduction . When hot planet energy is added to pure silicon, in the form of heat it can cause a few electrons to break free of their bonds and leave their atoms. These free carriers' electron, wandered randomly around the crystalline lattice looking for another hole to fall into and carrying an electrical current [8].

Zinc oxide Coating Solar Cell- zinc oxide is an oxide compound which has hexagonal wurtzite structure. It has good piezoelectric properties due to this reason it used in first electronic application as a thin layer for surface acoustic wave device. For improving the efficiency and reducing the cost of solar cell. We can used gallium arsenide is a semi conductor as alternative of silicon in solar cell. Usually Indium tin oxide coating is used for high electrical conductivity .but reality is China produces over half of the world's indium and has recently reduced its export quotas. Indium metal is relatively limited, costly and has a highly hot-blooded price. So for reducing the price, we want easily available low price material for coating which could be used for large-area transparent conducting oxide coatings for products such as solar photovoltaic cells. So we used zinc oxide that is cheap, non toxic and easy to synthesized. The coating with zinc is based on silicon-doped zinc oxide. The surface modification, achieved through a chemical synthesis of thin films, nanostructures and nanoparticles, suppressed the sun's reflection so the cell could absorb more light [9].

Polychromat solar cell-Composition of many colors is known as Polycromat. For reducing the cast of solar cell we can designed a thin layer made of a transparent plastic or glass that sort and concentrates sunlight to increases the overall efficiency of solar cells. This layer, known as a polychromat, this can be integrated into the cover glass of a solar panel. it is a very cheap optical element that can be integrated into the cover glass of a solar panel that will separate sunlight into various colors. The polychromate was made using photolithography. The polychromate placed on top of a photovoltaic device, when it placed on silicon solar cell and zinc oxide coating solar cell its know as polycromate silicon solar cell and zinc oxide coating polycromate solar cell; when energy exposed that device generates a voltage. The polycromate can be absorbed by appropriate solar cells to increase the efficiency of the overall process

III. COMPARATIVE ANALYSIS

An Article Joel hruska on extreme tech explain that cheaper solar cell built on inexpensive silicon have a maximum theoretical efficiency of 34% and practical efficiency 22 . if we apply the polycromate which theoretically increase the 50% and practical increase efficiency 16% then for understanding the new efficiency is 51% (34*1.50) theoretically and 25.52% (22*1.16). zinc oxide coating solar cell have the theoretical efficiency 33% and practical efficiency 14 then if we apply polycromate on this the new efficiency is 49.50% (33*1.50) and 16.20%(14*1.16)

	Silicon solar cell	Zinc oxide coating solar cell	Polycromate silicon solar cell	Zinc oxide coating plycromate solar sell
Theoretical efficiency	34%	33%	51%	49.50%
Practical efficiency	22%	14%	25.52%	16.20%

Table 1- comparative table

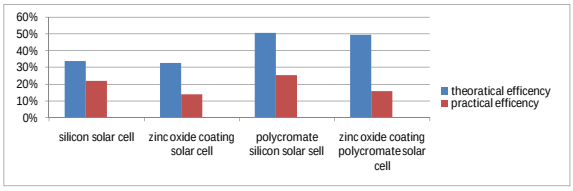

Fig 2 – comparative graph

IV. **RESULT & DISCUSSION**

Usually Indium tin oxide coating is used for high electrical conductivity .but reality is China produces over half of the world's indium and has recently reduced its export quotas. Indium metal is relatively limited. Gallium arsenide is a semi conductor as alternative of silicon in solar cell. costly and has a highly hot-blooded price. If we used the polycromate then it shown that we increase the17% and 16.5 % theoretical efficiency of polycromate silicon solar cell and zinc oxide coating polycromate solar cell respectively . As same as we can increase 3.52% and 2.20% actual efficiency of polycromate silicon solar cell and zinc oxide coating polycromate solar cell without increasing the cast.

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