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Wireless Solar Mobile Phone Charger

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Abstract --- *In almost all the countries mobile phones are the most popular form of communication. The number of mobile users will surpass 5 billion this year (2017) and the number is growing as technology is getting better and the cost of production also lowers.However it becomes very inconvenient for persons occupied with work or travelling long distances as the average lifetime of a mobile phone battery is less than 10 hours.Solar phone chargers use small solar panel to absorb light. This process still forces customers to carry another device along with their cell phone.*

I. INTRODUCTION

As technologyhas advanced and madeour phone smaller and easier to use we still have one of theoriginal problem that we must plug the phones into thewalls in order to recharge the battery. Most people acceptthe reality as there is no other option to this problem so theycarry extra batteries with them. Every time it is not possibleto charge mobile batteries everywhere at any time so wedesign this mobile charger from which we can charge themobile battery anywhere at any time. In this project we are using the concept of energy harvesting by using solarenergy for battery charging purpose. By using this we cancharge our mobile battery in remote areas where there is aproblem of electricity. Cost of this circuitry can be reducedto certain extend so that common man can easily purchasethat and get benefit from that. The goal of wireless sola mobile phone charger is to develop a small solar panel that can be placed on mobile phone itself, so the mobile can charge independently. There won't be any need of electrical outlets or solar panels. The mobile phone will be charged anywhere when exposed to sunlight.

II. Solar Cell

A. How are Solar Panels Made

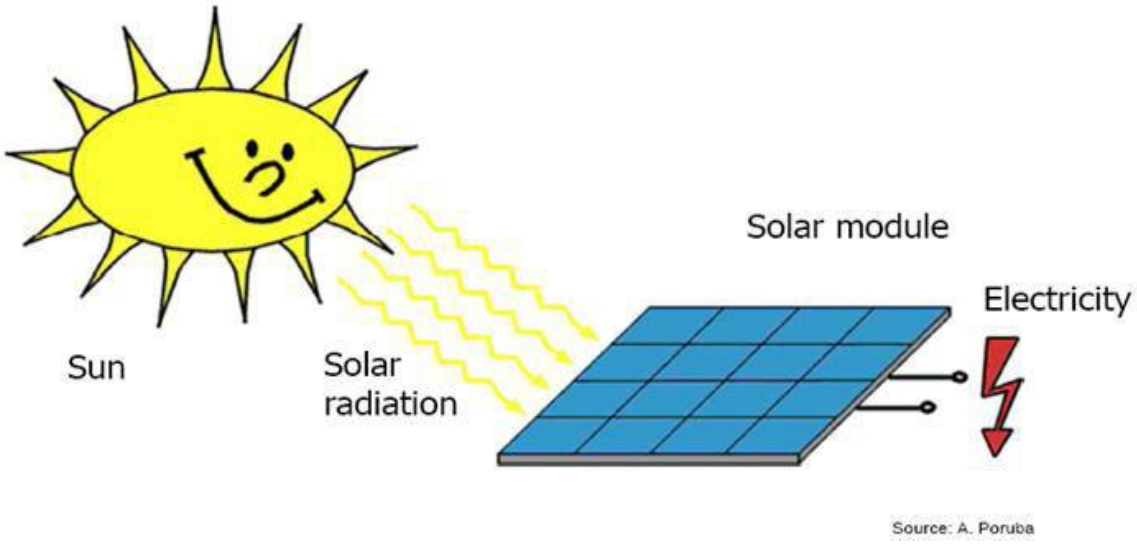
We are either relying on hydroelectric power which in turn causes environmental disaster or we burn coal or use nuclear energy to generateelectricity. The main reason why we are not able to use thesolar energy is our solar panels are not able to tap more than20% of its energy. This results in huge investment cost butlow return of investment. This makes the investment insolar energy unattractive and therefore is becoming less andless popular. However researchers all round the world havebeen able to develop solar panels that will tap this solarenergy more efficiently. As the world's resources are diminishing, governments are encouraging for a green movement to help conserve the limited supply. Solar energy is gaining popularity because of the free and abundant energy. This fact alone will save customers money on their electric bills. The energy is also clean and produces no hazardous waste like some of the other power generation resources.

Groups of photovoltaic cells electrically connected together are placed into frames where energy absorption can be concentrated. These casings are placed next to each other over a relatively large surface area to be as efficient as possible when absorbing the light. An anti-reflective coating is added to the solar panels to reduce power losses and obtain maximum absorption ability. Above that layer, a glass cover plate is used to create durability and protect against erosion.

"Figure 1. Anatomy of a solar cell" [1]

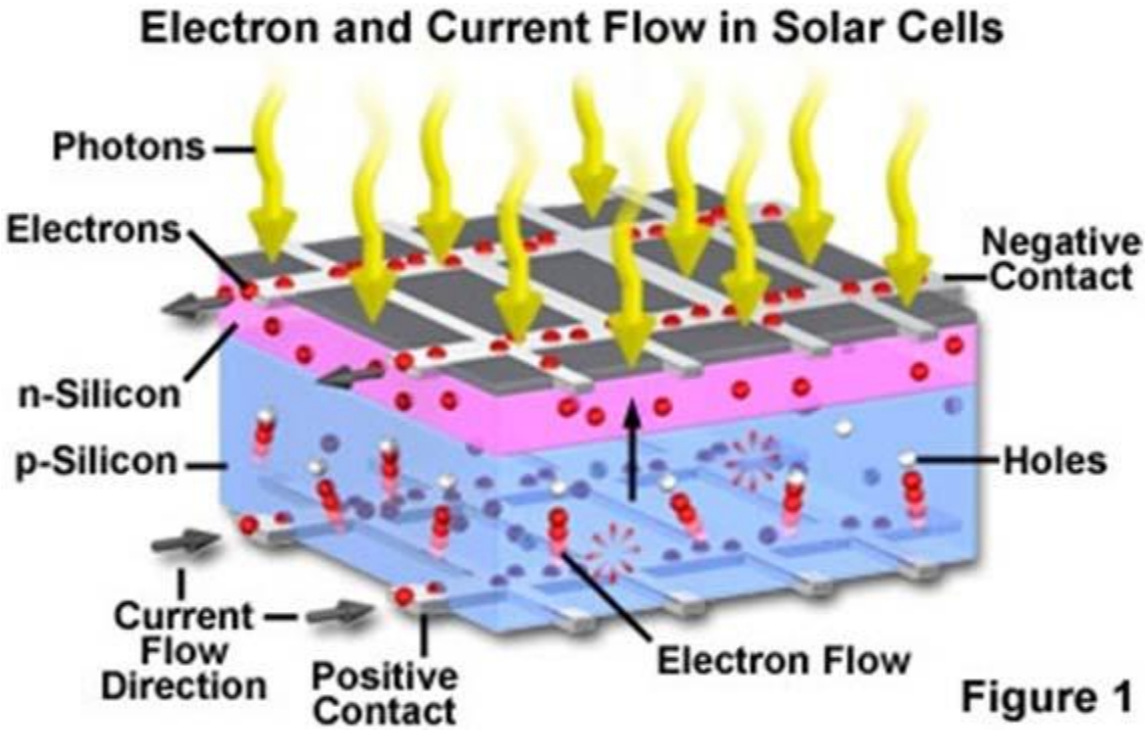
The driving force behind solar panels begins with the photovoltaic cells. These cells are responsible for converting photons from the solar light directly into electrons. The name itself originates from Greek words and can be broken down to photo which means "light" and voltaic which translates to "electricity". Photovoltaic cells are fabricated from special material known as semiconductors which fall right in between conductors and insulators when it comes to the magnitude of electron flow. Normally, the most commonly used semiconductor is Silicon. Silicon is the most common semiconductor used in solar panels because ofits ability to remain a semiconductor at very high temperatures under the sun. However, the silicon material used in solar cells must be doped and made impure because pure silicon crystalline serves as a very poor conductor of electrons. Once the silicon material is doped, a lot less energy is neededto knock the electrons out of their connections into a free flowing current. [2]

B. How electricity produces from solar panel



"Figure 2. Schematic of electricity generation by solar panel"

The generation of electricity from solar panels uses the same principle as that used to generate electricity from the chemical reaction using a standard battery. Its basic working depends on the semiconductor property of silicon.In order to understand how solar panels work weneed to understand how silicon works at an atomic level.Silicon in its pure form i.e. when all the impurities havebeen removed a silicon atom is bonded with another siliconatom. Since the valency of silicon atom is 8 which meansthat there are 8 electrons in its outermost orbit. However inits natural state there are only 4 electrons bounded in theoutermost orbit. Hence these 4 electrons are able to bondwith another 4 electrons with 4 silicon atoms around it. The4 free electrons that can move around throughout thesubstance. During the absence of electric potential thesefree electrons tend to remain close to their parent atoms sothat they are at minimum energy level. However when theelectric potential is applied across the substance these freeelectrons receive energy and move direction of the potentialdifference applied thus producing electric current. Howeverthe current produced in a pure semiconductor is quite less because these free electrons wants to remain at minimumenergy level possible. Now let us take an example of a puresilicon semiconductor and introduce a small amount ofphosphorus. Now this new atom has five electrons aroundit. When it bonds with other 4 silicon atoms, its fifthelectron is free. But again during the absence of potentialdifference, the fifth electron is bonded with the phosphorusatom. In presence of potential, these free electrons canmove in the direction of the potential difference appliedhence generating electric current. This phosphorus atom isnegatively charged this makes the silicon/phosphorus platenegatively charged. In the same way when anothersubstance such as boron is introduced in a pure siliconplate, it becomes positively charged. This is because boronhas valency 3 and there is one space left in the boron atomwhich is called “a hole”. Since this plate hence needs anelectron and hence it becomes positively charged, these twopositive and negatively charged plates when combinedtogether can now produce electricity. This is when the sun’senergy comes into picture. The solar radiation coming fromthe sun is used as a trigger to initiate a flow of electriccurrent from positive plate to the negative plate. Now whatexactly in the sun’s radiation causes the electrons toagitate is photon. When this photon falls onthe negative plates of the solar panel it knocks off freeelectrons on the plate. As this electron is loosely attached toits parent atom is freed it can now move around the plate.However this electron is attracted by the positively chargedplate and the electron is bounded again. In the same waywhen more photons knock off electrons, electricity isgenerated. The current produced by a single solar cell isvery less. However when this current is drawn by the wires,it can power a small motor or other small electronic devices.Many solar cells when combined together can producesufficient amount of electricity to power a house. Howeverthe main disadvantage of this technology is thatmanufacturing cost of these panels is very high, also youneed large amount of solar panels if your energyrequirement is very high. This is the reason why solarpanels and electricity produced through them have a veryhigh start up cost. The advantage is that when solar panelare installed they can produce electricity virtually free.[3]



“Figure 3. Electron and current flow in solar cells” [4]

C. Advantages of solar power

It is estimated that in 2025, of the total world's power generation, 10% will be by solar power. The solar power is free, the sun will be shining as long as the human race is around. In one hour more sunlight falls on the earth than what is needed by the entire population in one year. So this energy needs to be harvested. The potential for the solar energy industry is huge. As more and more people begin to realize the great benefits of solar power generation, they will start to shift towards using it. Solar panels have relatively long life spans of 30-40 years and rarely need to be replaced for being faulty. They also produce as much energy over their lifetime as nuclear fuel rods without hurting the environment. Solar panels work with no moving parts which results in silence as well as a miniscule requirement for maintenance. The energy from the sun can be converted into AC power to charge devices, can be stored in batteries.

III. Prototype Model

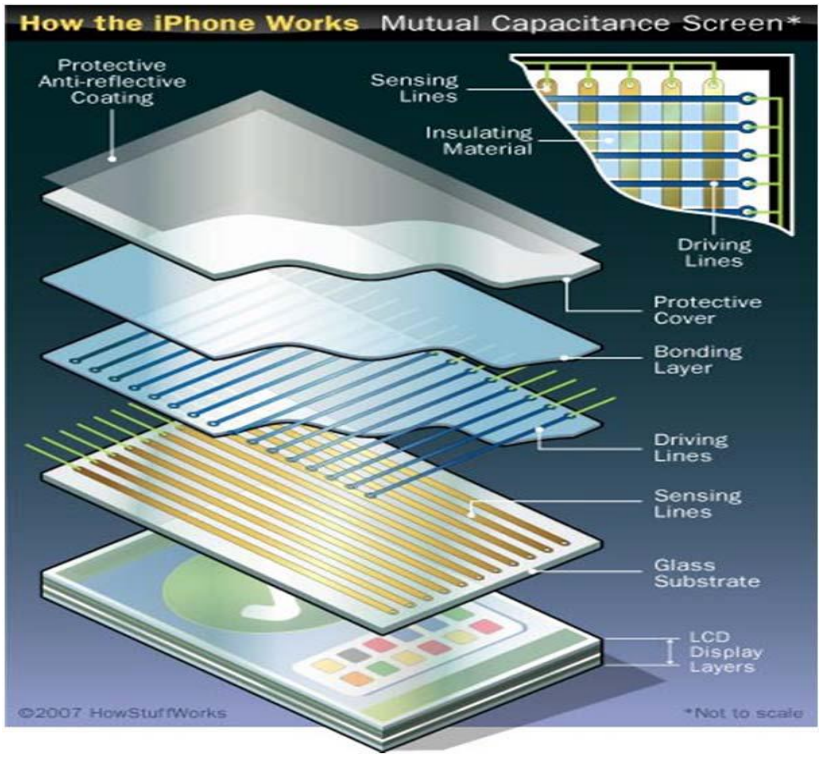
A. Back Panel

We have considered IPhone 4 as prototype model. Two different solarpanels used on phones, one on front and another on back. The dimensions of the IPhone 4 are 110 mm high by 59 mm wide. So a solar panel of dimensions 100 mm by 50 mm would be used to cover the back side of the phone. The mobile phone can be charged anywhere, anytime by simply placing the mobile phone upside down, as this side would be the most efficient energy absorbing cell of the two films used on this device.

"Figure 4. Solar panel on backside of mobile phone" [5]

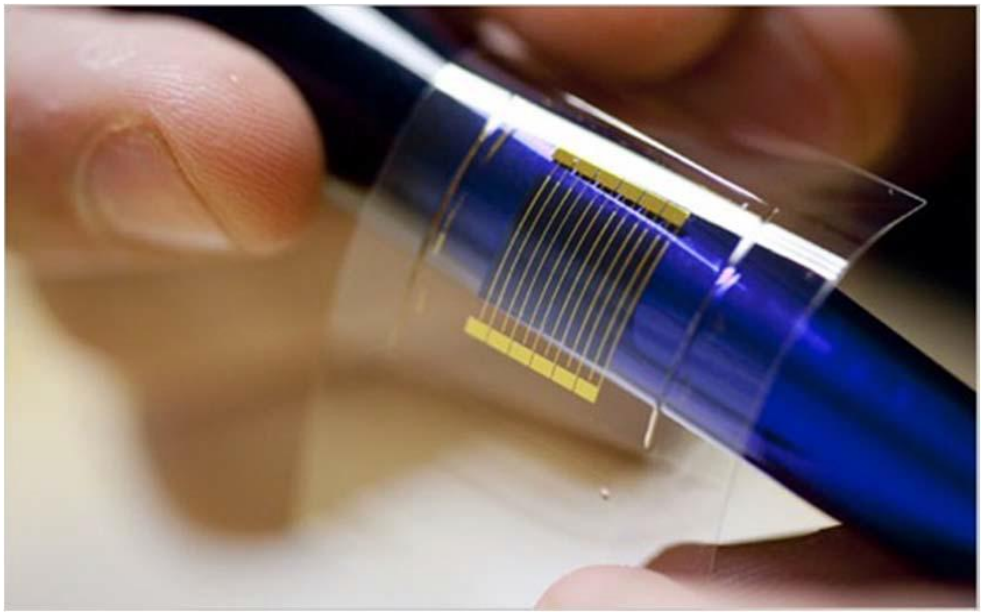
B. Front Screen

An ultrathin semi-transparent solar cell on beneath the glass substrate layer is to be placed, which will allow for solar energy to be absorbed while the phone is facing up towards the sky. LED screen will also be producing energy for solar cell. In this way the solar film will be getting power from both ways, but most from sun.



"Figure 5. Solar panel on front side of mobile " [6]

The film used on the front will be new technology that was developed from different sources:Ultrathin, transparent and flexible solar cells. A research group at the University of Illinois (*Prof. John Rogers*) has confirmed that there are new etch methods for Siliconand Gallium Arsenide which allow slicing off ultrathin wafer layers (2-20 microns) that can be formed into micro solar cells.But these organic photovoltaic cells are NOT very efficient (only ~6%) at converting sunlight to electricity. Although having this in addition to the solar panel on the backof the phone will certainly help the charging process



"Figure 6. Ultrathin, transparent and flexible solar cell" [7]

C. Battery Charge

An Apple iphone4 (our prototype) uses a Lithium-ion battery with 3.7V and 5.25 Whr specifications. Lithium-ion batteries are the most widely used as they are light, portable and able to operate for long periods of time. The solar cells would be custom designedto conveniently satisfy these requirements and be able to charge from 0 to 100% in usual recharge period (about 1 hr). In the process of charging a Lithium-ion battery, electricity moves through the cell and the lithium ions migrate from the negative cathode to the positive anode, where they wait for the circuit to be closed and return back to the graphite cathode. The phone battery will be constantly charging. Although there is no harm in constantly charging the Li-ion battery but some users may not like it so we would also give the user a choice to enable or disable charging of battery. In fact, recharging of a Li-ion battery is an endothermicprocess which means the battery absorbs heat when it recharges and thus there is no additional heat produced in the process. [8]

IV. Advantages

A. Cost Effective

Compared to the other mobile chargers, the solar chargers are cost effective as it absorbs power from the sun. It does not require electric power.

B. Versatile

It is also known to be versatile as it can be used for all types of mobile phones.

C. Uninterrupted Power Supply

One of the greatest advantages of solar mobile phone charger is that it can be used to charge mobiles even during power outages.

D. Emergency Purposes

Another benefit is that it hardly requires any electrical outlet. It can therefore be used during emergencies and outdoor purposes.

V. Conclusion

Wireless Solar mobile phone chargers are simple, portable and can be used by anyone especially in remote areas. It has borne an innovative way of charging phones. However, there are always ways for improvement in the future. An improvement that can be worked on is decreasing the thickness of solar cells without losing efficiency.

REFERENCES

[1]. http://www.hightechscience.org/solar_express.htm
[2]. Gilburt L ChiangSanyam BajajAdvisor: Steve Bibyk
[3]. International Journal of Innovative Research in Computer Science & Technology (IJIRCST)ISSN: 2347-5552, Volume-2, Issue-4,July-2014.
[4]. http://micro.magnet.fsu.edu/primer/java/solarcell/
[5]. http://www.skldintl.com/solar-cell-phone.htm
[6]. http://electronics.howstuffworks.com/iphone2.htm
[7]. http://www.ecofriend.com/entry/eco-tech-semitransparent-solar-cells-to-begin-a-new-era-of-solarelectronics/
[8]. David Gunderson, “Li-ion battery temperature trends during charge and discharge” http://www.micro-power.com/userfiles/file/mp_tempcharge-1250026530.pdf

