REVIEW ON BLACK SILICON SOLAR CELLS

1)Nikhil Bajaj 2)Parag Gawande 3)Shubham Patil 4)Pranay Itankar

Student at Mechanical Engineering Department,

G.H. Raisoni College of Engineering, Maharashtra, India

ABSTRACT:-

Renewable energy is the future of the energy. All cities and countries leads to use renewable energy sources to decrease the load on non-renewable energy sources. Solar energy is one of the different options of renewable energy source. The solar cell which absorbs more light will able to give more efficiency. Less reflection of light tends to increase the efficiency of the solar cell which results in more electricity. The Nano structuring of silicon surfaces leads to eliminate the front surface reflection in photovoltaic devices. The technique lead in increasing in efficiency and reducing the initial cost of the system. The black silicon solar cell allows the system to absorb more than 98% light shining on it. The surface recombination issue is solved by providing conformal alumina film which provides chemical and electrical passivation.

Keywords:-*Solar cell, Nano Structuring*

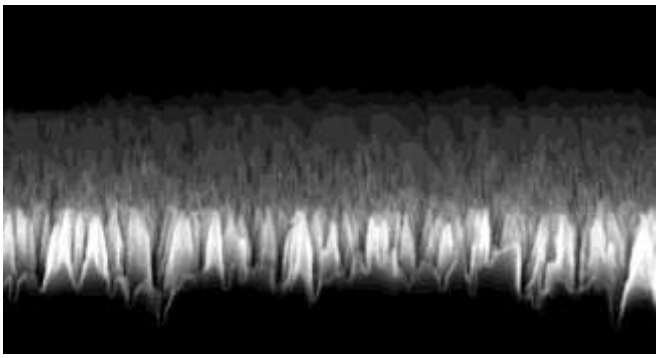
1.INTRODUCTION:-

Black silicon absorbs light in very efficient manner. It absorbs light at high range of wavelength. The black silicon will cause a gradual change in silicon density with particular change in depth and tends to change in it refractive index. Plasma immersion, ion implantation and cryogenic deep reactive ion etching are different process used for fabrication of black silicon. Cryogenic deep reactive ion etching is fast and inexpensive process. Black silicon is used in solar cells to increase the absorption of shining light falling on it which leads to decrease in deflection of sunlight and increase in efficiency of the solar cell.

2.LITRATURE SURVEY:-

Solar panels are used to absorb the solar energy comes from the sun. Basically solar panels are blue in colour but sometimes they are used in black colour also. The different colour of the solar panel is depends upon the type of the silicon used within it.The blue colour (polycrystalline) appears on the solar panel due to it's anti-reflective coating that's helps to improve the efficiency of the solar panel. The black solar panels (monocrystalline) absorbs more sunlight due to it's black surface this feature makes black coloured solar panels more efficient than blue colour solar panel.

Black coloured and blue coloured solar panels offered unique benefits and drawbacks. Black coloured solar panel is more efficient than blue coloured solar panel but on other hand this efficiency comes with greater initial cost than blue coloured solar panels.



3)PROPERTIES OF BLACK SILICON:-

Black silicon is a semiconductor. The modification of the surface of silicon is done in such a way that it contain very low reflectivity and accordingly high absorptivity of the light falls on it. Black silicon is monocrystalline having height 10 µm and it has a diameter less than 1 µm. It has a needle-shaped structure. The main property of black silicon solar cell is the absorptivity of solar radiations coming from sun that falls on the solar cell. The black silicon solar cell absorb more light than blue silicon due to it's modification in surface of silicon. Within the surface there is no change in interface but a periodic change occurs within the refractive index. The reflectivity of the light is reduced within the black silicon up to 5%.

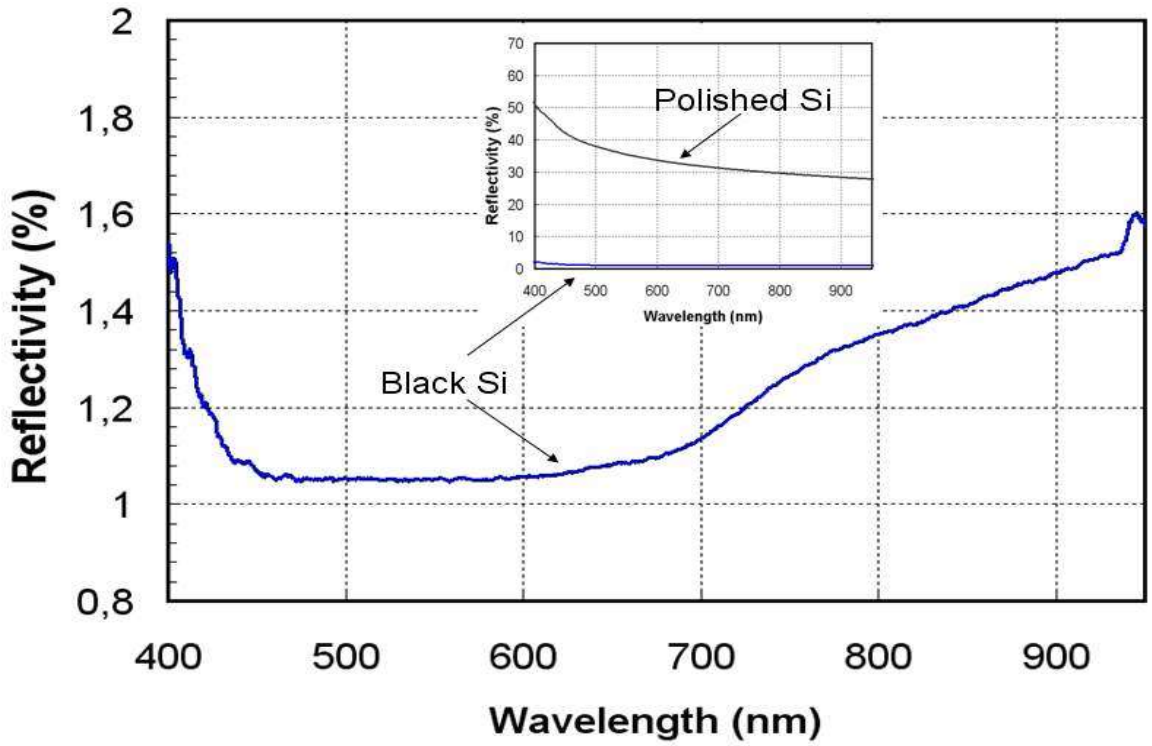


CHART-1 Wavelength vs. Reflectivity graph

CONCLUSIONS:-

The black silicon minimizes the reflection of solar radiations falling on the surface of the solar cells. The black silicon absorbs the solar radiation in more quantity than blue silicon solar panel due to this the efficiency of the black silicon is get increases which may lead to increase in the electric power generation developed by the solar panels. On other hands the black solar panels are expensive in manufacturing and installation due to which the initial cost of the system get increases.

If solar panel efficiency is your main attraction then you will go for black silicon solar panel but f you are thinking about lowest cost solar panel then blue coloured solar panel is be the right choice.

REFRENCES:-

1) Postprint manuscript for self-archiving purposes.
Nature Nanotechnology (2015) doi:10.1038/nnano.2015.89
http://www.nature.com/nnano/journal/vaop/ncurrent/full/nnano.2015.89.html

2) NREL's Black Silicon Increases Solar Cell Efficiency by Reducing Reflected Sunlight.

3) https://news.energysage.com/why-are-solar-panels-blue.

4) Clapham, P. B. & Hutley, M. C. Reduction of lens reflection by the "Moth eye" principle. *Nature* **3**, 281-282 (1973).

5) Zhu J. et al. Optical Absorption Enhancement in Amorphous Silicon Nanowire and Nanocone Arrays. Nano Lett. 9 279 (2008).

6) Garnett, E & Yang, P. Light trapping in Silicon Nanowire Solar Cells. Nano Lett., 10, 1082-1087 (2010).