PARIPEX - INDIAN JOURNAL OF RESEARCH | Volume - 11 | Issue - 06 | June - 2022 | PRINT ISSN No. 2250 - 1991 | DOI : 10.36106/paripex

ORIGINAL RESEARCH PAPER

Engineering

ENERGY GENRATION USING TRANSPRENT FLEXIBLE SOLAR CELL

KEY WORDS:

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ABSTRACT

Elastic solar cells has applications in satellites, airships, drones, individual soldier equipment, building integrated photovoltaic panels, and wearable smart devices, indicating that they have substantial commercial potential. The cell architectures, fabrication processes, and present status of four types of flexible solar cells, namely silicon thin film, Cadmium telluride, CIGS, and polycrystalline, are the subject of this research. The main challenges of efficiency enhancement and the principal issues associated with the industrialization of flexible solar cells are also discussed. Finally, based on features of substrate development, efficiency enhancement, and industrial manufacturing, the study makes recommendations

INTRODUCTION

The manufacturing of thinner and more flexible solar cells is the current trend in solar cell development. When compared to crystalline silicon solar cells, thin film solar cells require less raw materials and less energy to manufacture, as well as lower production costs. Thin film solar cells can also be produced with metal foils or plastic substrates to create flexible solar cells. Flexible solar cells are small, light, and portable, and can be used in a variety of applications, including satellites, airships, drones, individual soldier equipment, and other military defense applications, as well as integrated photovoltaic cells, wearable smart devices, and other civilian applications.

Flexible solar cell development status

Silicon thin film solar cells, CIGS solar cells, Copper indium solar cells, and photovoltaic cells are the four main types of flexible solar cells now available. Metal foils (stainless steel, molybdenum, titanium, metal, copper, etc.) and plastics (PI, PEN, etc.) are the most common materials that can be employed as flexible substrates, Polyester, etc.). Silicon thin film and CIGS solar cells were two forms of flexible solar cells which already have commercial cell modules.

Solar cells made of flexible silicon thin film –

Silicon thin film solar cells were the first thin film solar cells to be researched and marketed. Silicon thin film solar cells can be made into single-junction or multi-junction solar cells because their band gap can be adjusted between 1.1 and 1.7eV and they can absorb sunlight of various wavelengths. Stainless steel or plastic substrates can be used to make silicon thin film solar cells. According on the transparencies of the substrates utilized, the structure of their flexible substrate can be categorized as nip-structured or pin-structured. Figure 1 shows the cell structures. United Solar, USA, fabricated the most efficient flexible silicon thin film solar cell employing stainless steel substrates, with a maximum efficiency of 16.3 percent [3] and an area of 0.25 cm2. United Solar also produced the most efficient flexible silicon thin film solar cell module, which had an aperture efficiency of 8 per cent and a power of 144 W [4]. With plastic substrates, however, there is no silicon thin film solar cell module.

Flexible silicon sheet solar cells mounted on a metal substrate .By depositing a silicon thin film solar cell over a stainless steel substrate, flexible silicon film solar cells with a metal can be created. The cell structure is a nip structure since the stainless steel substrate is opaque. United Solar is the first and only business to perform research on flexible silicon thin film solar cells with this sort of stainless steel substrate design, as well as the only company to market the device.

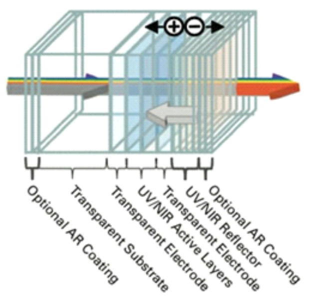

Figure 1:Transparent solar cell

This schematic diagram shows the key components in the novel transparent photovoltaic (PV) device, which transmits visible light while capturing ultraviolet (UV) and near-infrared (NIR) light. The PV coating—the series of thin layers at the right—is deposited on the piece of glass, plastic, or other transparent substrate. At the core of the coating are the active layers, which absorb the UV and NIR light and cause current to flow via the two transparent electrodes through an external circuit. The reflector sends UV and NIR light back into the active layers, while the anti-reflective (AR) coatings on the outside surfaces maximize incoming light by reducing reflections.

Spectral response of conventional and transparent PV cells

That critically placed gap makes the MIT solar cell transparent to the human eye—but it also means that the cell does not capture all the incident energy. "We do let the visible photons [light particles] pass through, allowing them to efficiently light the room. But we try to catch all of the photons in the infrared and ultraviolet," says Bulovi . "We try not to let any of those photons get through. So a honey bee—which sees in the ultraviolet—wouldn't think it's transparent, but we humans do."

Current versions of the team's cells transmit more than 70% of the visible light, which is within the range of tinted glass now used in the windows of buildings. But their power-conversion efficiency is low—only about 2%. In a detailed theoretical analysis, Lunt, Bulovi , and others showed that their design should realistically be able to reach over 12% efficiency, a rating comparable to that of existing commercial solar panels.

Getting there will be a challenge, but they believe they can do it by carefully optimizing the composition and configuration of the PV materials. Indeed, says Lunt, by simply "stacking" their transparent solar cells, they could potentially reach an efficiency of 10% while still maintaining the ability to transmit light. Already they have demonstrated that an array of transparent cells integrated in series can power the liquid crystal display on a small clock, relying entirely on ambient light.

Costs and benefits

The cost of implementing the technology will vary with the application, solar cell efficiency, and other factors. But Barr cites several sources of potential cost savings over traditional solar systems. For instance, the processes used in fabricating the new transparent PVs are environmentally friendly and not energy intensive. Indeed, the coatings are deposited at nearly room temperature, so the transparent PV can be laid down on essentially any type of surface. There's no need to use glass, which is a costly component in the fabrication of conventional systems.

CONCLUSIONS

Flexible solar cells are present in satellites, airships, drones, individual soldier's equipment, and other defence and military domains, as well as in building integrated photovoltaics, wearable smart devices, and other civilian applications, demonstrating a broad market potential. The efficiency of the four types of flexible solar cells have significantly improved after years of development. Flexible silicon film solar cells have the highest efficiency of 16.3 percent; flexible CIGS solar cells have the highest efficiency of 20.4 percent; flexible CdTe solar cells have the highest efficiency of 13.8 percent; and flexible perovskite solar cells have the highest efficiency of 18.4 percent. Furthermore, flexible silicon thin film solar cells.

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