Comparison of Energy Efficiency, Eco-Friendliness, Cost, and Convenience of Phase-Change and Biosolar Materials in Solar Panels

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Purpose

The purpose of this study is to conclude whether bio-solar materials or phase change materials are better in terms of energy efficiency, eco-friendliness, and cost and convenience in solar panels. We will explore these factors in a variety of different conditions and designs, for each type of material. To come to the most accurate conclusion, we created a rating system, based on government regulations, industry standards, and common scientific values.

Background Info

Two materials currently being researched for solar panels are phase change materials (PCM) and biosolar materials. PCMs are useful in solar panels since they can hold their shape, are thermally conductive, and are corrosion-resistant (Dwivedi et al., 2016). However, their efficiency can be affected by temperature, they are very expensive, and they need a secondary panel since they cannot generate power directly. Biosolar materials do not need to be used in conjunction with different materials for generating electricity and can form the whole solar cell, but it requires specific species of bacteria and must be cleaned regularly (Reshma et al., 2017).

Experimental Methods

Figure 1. Biosolar Solar Panel Layout.

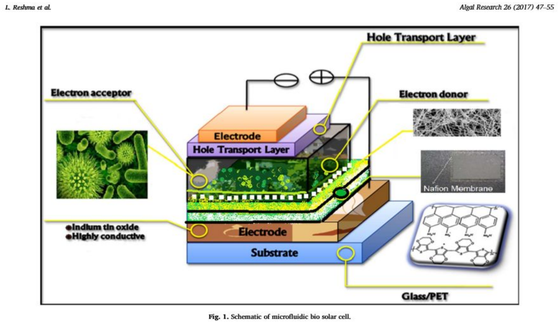

Fig. 1. Schematic of microfluidic bio solar cell.

Figure 2. PCM Solar Panel Layout.

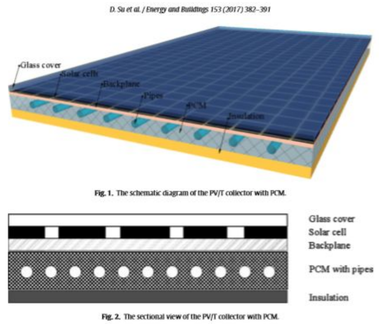

Fig. 2. The sectional view of the PV/T collector with PCM.

Efficiency

- Voltmeters and ammeters will measure voltage and current.
- Measurements in the morning, afternoon, and evening.
- Different test variables, including amount of sunlight exposure, cleanliness, temperature, weather, and more.

Eco-friendliness

- Measure the effects created by each material on natural water and air.
- Comparison of data to current environmental regulations and industry standards.

Cost and Convenience

- Keep track of the materials that we use, how much we use of each material, and how much each material costs.
- Potentially test alternative materials to see if there is a benefit to using more or less expensive materials.
- Look at ease of installation, maintenance, and versatility.

Expected Outcomes

Table 1. Decision Matrix in Comparing Aspects of PCMs and Biosolar Materials.
* Poor +, Average ++, Good +++, Excellent ++++

Category	Phase Change Materials (PCM)	Biosolar Materials
Efficiency	++++	+++
Eco-Friendliness	++	++++
Cost	++	+++
Convenience	+++	++

Future Implications

- We believe that biosolar materials will be the best choice of material, because it will be efficient, eco-friendly, and low cost.
- Future work should focus on the development of biosolar material solar panels.

References

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