



A comparative study of the direct current electrical efficiency of solar cells mounted on the windows of a model house.

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Abstract

This study investigates DC electricity generation using PV cells installed on a transparent glass window of a small-scale house model under real climatic conditions in Bangkok. Six polycrystalline PV cells were arranged in two vertical rows and tested at different window positions (top, middle, bottom). Results show that transmitted solar radiation can generate electricity, demonstrating potential for building-integrated PV applications.

Methodology

Two identical small-scale house models were constructed and tested in Bangkok, Thailand, to evaluate a transparent glass window integrated with photovoltaic (PV) cells under real climatic conditions. A single-pane glass window (72 × 42 cm², 0.5 cm thick) with six polycrystalline PV cells was installed on the south-facing wall in three vertical positions (top, middle, bottom). Key environmental and thermal parameters were recorded every 5 minutes from 08:00 to 18:00, and DC electrical output was calculated using a 1-ohm resistor based on Ohm's law.

Results

Figures 2-4 indicate that DC power output from PV cells at different positions (top, middle, bottom) was similar throughout the day, ranging from 13.8 to 32.5 W with a peak at approximately 12:55.

This consistency is attributed to uniform solar radiation transmission through the glass under stable test conditions without air-conditioning.

Discussion and conclusions

This study demonstrates the feasibility of generating DC electricity using small-scale PV cells installed on the inner surface of a transparent glass window in a small-scale house model. The results highlight the potential of utilizing transmitted solar radiation for energy-saving applications and promoting building-integrated photovoltaic systems.

References

Chantawong, P., et al, 2008. Investigation on the Thermal Performance of Glazed Solar Chimney Walls Under hot humid Climate of Bangkok, The Journal of Industrial Technology, Vol. 4, No.1, January – June, pp. 28-35.
 Yener, A. K., 1999. A method of obtaining visual comfort using fixed shading device in room. Journal of Building and Environment. Vol. 34, pp. 285-291.
 Khedari, J., et al, 2001, Thailand climatic zones, Journal of Renewable Energy, Vol. 25, pp.267-280.

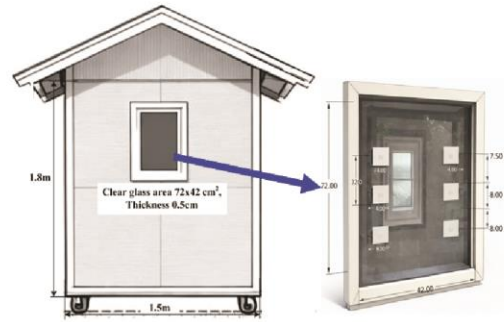


Figure 1 Window integrated PV Cell

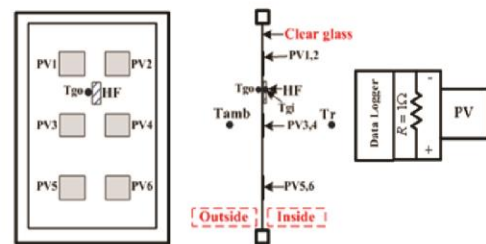


Figure 2. Temperature measurement instruments and the electrical output of PV Cell

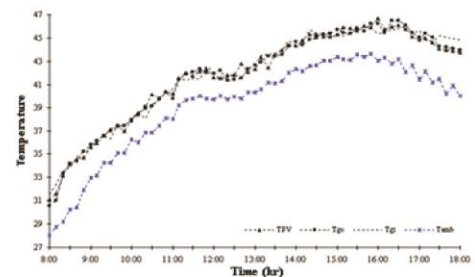


Figure 3 Variations of PV cell temp, inner and outer

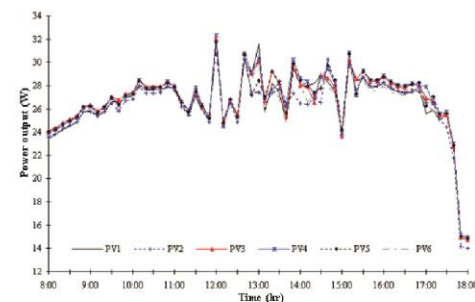


Figure 4 Variation of heat flux 6 Comparison of DC electrical power generation