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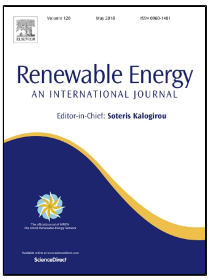

Transmittance optimization of solar array encapsulant for high-altitude airship

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Transmittance optimization of solar array encapsulant for high-altitude airship

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Abstract

The efficiency of solar cell is a critical problem to the energy management of high-altitude airship. Excessive temperature and solar radiation intensity of solar cell will reduce the cell efficiency. The main purpose of this study is to increase the energy output of solar array through optimizing transmittance of solar array encapsulant. The thermal and heat transfer models of solar array were considered during the investigation of the effect of transmittance on output performance of solar array. And the optimization model of transmittance is presented to obtain the optimum transmittance in different working conditions for the first time. The feasibility of the numerical model is verified by comparison with experimental data of the temperature of solar array during a day. The results indicate that the output performance of solar array is variable under different transmittances and the optimum transmittance of solar array is changing with the working latitude and date. The simulation results show that the maximum increase of output energy can reach up to 0.5 MJ on summer solstice. The optimization study provides both theoretical and practical support for choosing optimal encapsulant materials in the preparation stage of high-altitude airship.

Key words:

Optimum transmittance; Solar array; Energy; High-altitude airship; Thermal effect

Nomenclature

A	=	the area, m^2
c	=	specific heat capacity
D	=	the maximum diameter of airship, m

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