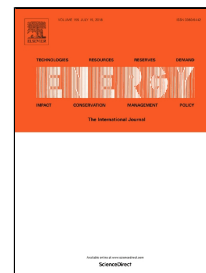


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Experimental study on a novel photovoltaic thermal system using amorphous silicon cells deposited on stainless steel

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1 **Experimental study on a novel photovoltaic thermal system using** 2 **amorphous silicon cells deposited on stainless steel**

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10 **Abstract**

11 Amorphous silicon (a-Si) cells are able to perform better as temperature increases due to the
12 effect of thermal annealing. a-Si cells have great potential to solve or ease the problems of
13 high power temperature coefficient, large thermal stress caused by temperature fluctuation
14 and gradient, and thick layer of conventional crystalline silicon cell-related
15 photovoltaic/thermal (PV/T) collectors. In this paper, an innovative a-Si PV/T system is
16 developed. It is the first time that a-Si cells deposited on stainless steel have been used in a
17 practical PV/T system. The system comprises of two PV/T collectors. In each collector, there
18 are 8 pieces of solar cells in series. Long-term outdoor performance has been monitored.
19 Experimental results on the thermal efficiency (η_{th}), electrical efficiency (η_{PV}) and I-V
20 characteristic are presented. The peak instantaneous $\eta_{th,p}$ was about 42.49% with the
21 maximum $\eta_{PV,p}$ of 5.92% on April 2, 2017. The daily average $\eta_{th,a}$ and $\eta_{PV,a}$ were 32.8% and
22 5.58%. Accordingly, $\eta_{th,p}$, $\eta_{PV,p}$, $\eta_{th,a}$ and $\eta_{PV,a}$ on October 27 were 43.47%, 5.69%, 38.65%
23 and 5.22 %. During more than half a year operation, no technical failure of the system has
24 been observed. The feasibility of the a-Si PV/T is preliminarily demonstrated by the prototype.

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