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microprocessors

integrated circuits

## **Using Heat Sinks in Thermal Cooling Solar Cells and its Effect on Cell Performance**

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### **ABSTRACT**

In this research, a heat sink which is normally used to cool electronic devices, integrated circuits and microprocessors, is used to cool a solar cell and study the effect of this cooling method on solar cell temperature and performance. We use a halogen lamp as a light and heat source. The results show that when solar cell temperature increases, the open circuit voltage of solar cell decreases rapidly, but when we use the heat sink, the temperature increases slower at the same time of duration therefore the open circuit voltage

decreases slower than the first case. This means that the solar cell will work at a higher efficiency under the same condition.

**Keywords:** Cooling of solar Cell, heat Sink, thermal compound.

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(Huang *et al.*, 2011)

( )

"

.(Tong, 2011) (heat sink)

( )

"

(200 W/m °C)

(0.2 W/m °C)

(Vlachopoulos and Strutt, 2002) .

(Nelson, 2003)

"

.(Jha, 2010)

$T_c$                        $V_{oc}$

$V_{oc}$

$V_{oc}=f(S,T_c)$                       .....(1)

:

.....

W/m<sup>2</sup>

S °C

T<sub>c</sub>

T<sub>top</sub>

: (Huang *et al.*, 2011)

T<sub>bottom</sub>

T<sub>c</sub> = T<sub>av</sub> = (T<sub>top</sub>+T<sub>bottom</sub>)/2 ..... (2)

( )

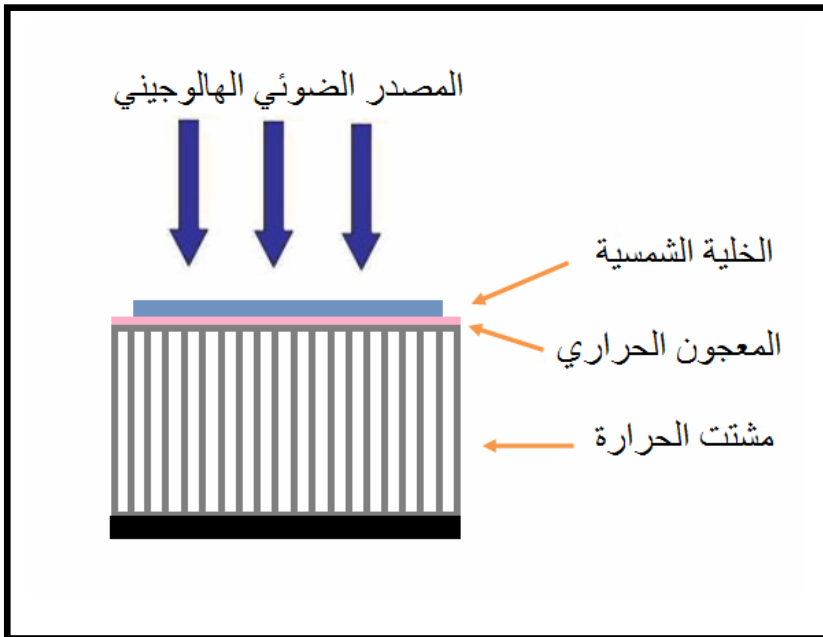
k

Seebeck

(1)

.(Theraja, 2009)

(mV)



:1

(Si)  
(0.3 cm) (10.5\*9.5 cm) (50 cm) (500 W/m<sup>2</sup>)

.....

(type k-thermocouple)

(90 cm)

20

$V_{oc}$

:

(1)

"

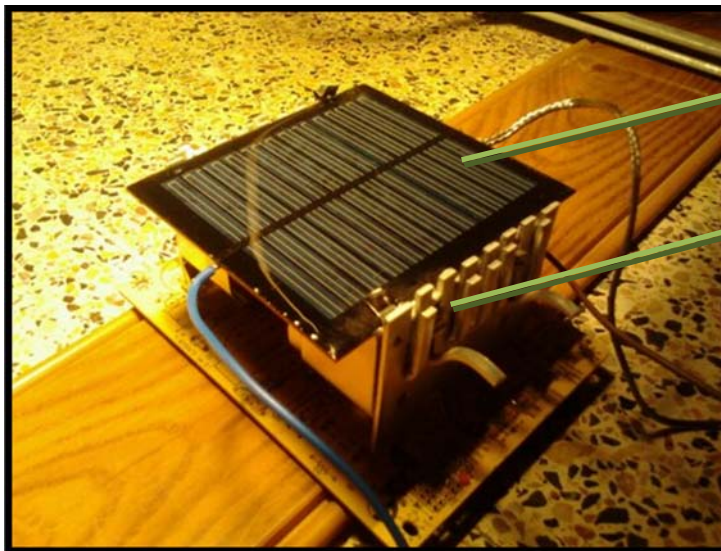
:"

( )

$V_{oc}$

(2)

(2)



الخلية الشمسية

المشنت الحراري

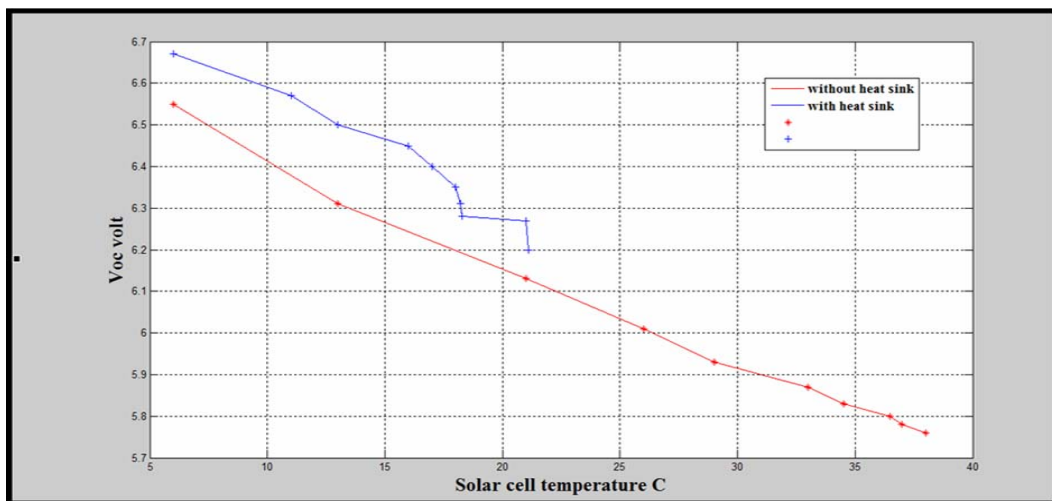
:2

:1

(min)	(V)	( ° C)
2	6.55	6
4	6.31	13
6	6.13	21
8	6.01	26
10	5.93	29
12	5.87	33
14	5.83	34.5
16	5.80	36.5
18	5.78	37
20	5.76	38

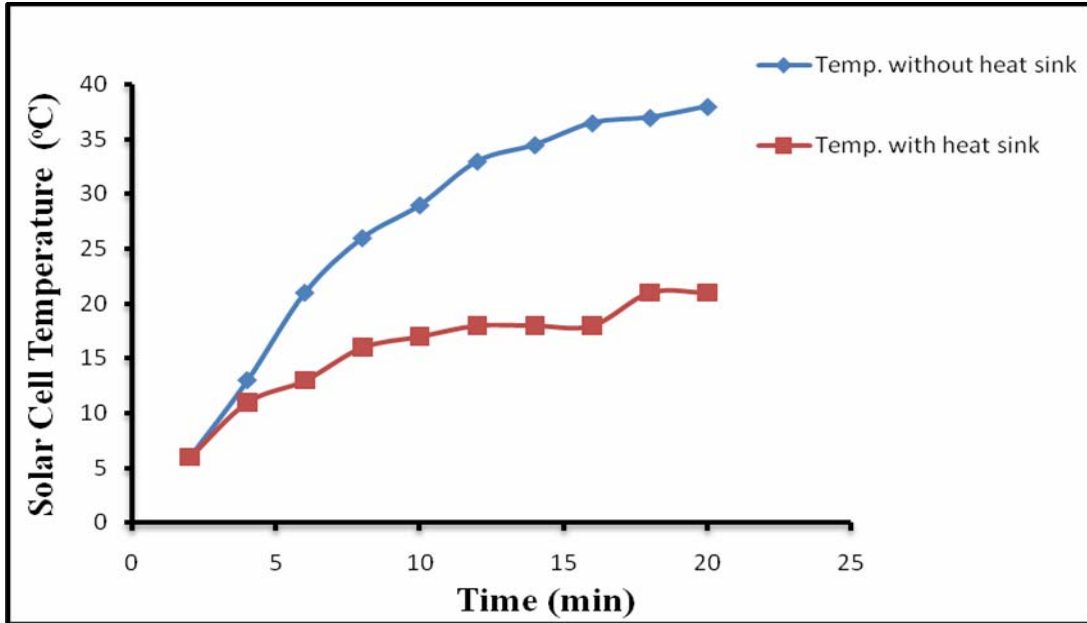
:2

(min)	(V)	( ° C)
2	6.67	6
4	6.57	11
6	6.50	13
8	6.45	16
10	6.40	17
12	6.35	18
14	6.31	18.2
16	6.28	18.3
18	6.27	21
20	6.20	21.1



:3

.....



:4

(1)

(3)

(3)

(2)

(4)

(3)

( $\Delta T$ ) ( $\Delta V_{oc}$ )

$V_{oc} = -0.052 \text{ V}$

( $\Delta T = 3.55 \text{ }^\circ\text{C}$ ) ( $\Delta V_{oc} = -0.087 \text{ V}$ )

( $\Delta T = 1.67 \text{ }^\circ\text{C}$ ) ( $\Delta$

.1

( )

"

.2

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