Supplementary Material

A - Summary of Experimental STEG Results

Author	Year	Efficiency	TE Material	γ_{op}	γ_{th}	T_h (°C)	T_c (°C)
Telkes [1]	1954	0.63%	ZnSb/BiSb (experimental)	1	1	80	35
Telkes [1]	1954	3.35%	ZnSb/BiSb (experimental)	50	1	260	20
Rush $[2]$	1964	0.7%	Bi_2Te_3 (commercial)	-	-	-	-
Goldsmid [3]	1980	1.4%	Bi_2Te_3 (commercial)	1	100	90	35
Goldsmid [3]	1980	0.5%	Bi_2Te_3 (experimental)	3	-	150	30
Amatya & Ram [4]	2010	3%	Bi_2Te_3 (commercial)	66	-	-	-
Suter [5]	2010	0.08%	Perovskite (experimental)	300	11	625	75
Kraemer [6]	2011	4.6%	Bi_2Te_3 (exp, nanostructured)	1.5	200	200	20

TABLE I: A summary of experimental data from previous STEG studies.

B - Temperature Gradients Across the Absorber

Vertical Temperature Distribution

As discussed in the Methods section, the absorber surface temperature (T_{abs}) and the TE hot side temperature (T_h) will differ slightly. However, approximating these temperatures as equal makes for much simpler calculations. In order to justify this assumption, we have calculated the difference between T_{abs} and T_h as a function of T_h for several levels of incident flux. This calculation was performed for a 5 mm thick absorber with a κ_{abs} of 55 W/mK (an approximate value for graphite at 1000°C). The TE material has a κ_{TE} value of 1 W/mK and a constant zT of 1. We see that there is at most a 3.6% difference between T_{abs} and T_h .



Fig. 1: Vertical temperature distribution across the absorber

Horizontal Temperature Distribution

The issue of temperature uniformity across the absorber has been addressed by Kraemer, et al. [6]. In this work the absorber is approximated as a annular fin, and the radial temperature distribution can be calculated using modified Bessel functions of the first and second order. Here, we assume that T_h is uniform across the TE leg, which has a diameter of 1 cm. We then plot the temperature difference over the entire absorber, which has a diameter of 5 cm (using the same absorber thickness and thermal conductivites as above). This 25-fold thermal concentration value is quite large for the thermal length values considered here.



Fig. 2: Horizontal temperature distribution across the absorber

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- [6] Kraemer, D. et al. High-performance flat-panel solar thermoelectric generators with high thermal concentration. *Nature Materials* 10, 532–538 (2011).