# Supporting Information

**Title**: Reliable Contact Fabrication on Nanostructured $Bi_2Te_3$-Based Alloys for High Performance Flat-Panel Solar Thermoelectric Generators

Shien-Ping Feng*, Ya-Huei Chang, Jian Yang, Bed Poudel, Bo Yu, Zhifeng Ren* and Gang Chen*

Based on the ratio of total STEG resistance at operating temperature to initial STEG resistance at room temperature, we assume that the ratio ($\chi$) increases because of the increase of contact resistance, which can be calculated from,

$$\chi = \frac{R_{\mathrm{TE-x}} + 2R_{\mathrm{cx}}}{R_{\mathrm{TE-i}} + 2R_{\mathrm{ci}}} \qquad \text{(S1)}$$

where $R_{TE\text{-}i}$ and $R_{ci}$ are the initial resistance of thermoelectric leg and the initial contact resistance respectively, $R_{TE\text{-}x}$ and $R_{cx}$ are the resistance of thermoelectric leg and contact resistance under operating temperature. We make the following assumptions in the modeling:

(1) Based on the Table 1, the initial contact resistance is around 1% of the resistance of thermoelectric material. $R_{ci}$ / $R_{TE\text{-}i}$ = 1%.

(2) The resistance of $Bi_2Te_3$-based thermoelectric alloys at operating temperature ($\Delta T$=200 $^{o}$C) would increase 1.5 times compared with the initial resistance at room temperature. $R_{TE\text{-}x}$ / $R_{TE\text{-}i}$ = 1.5.

(3) The average resistivity of nanostructured $Bi_2Te_3$-based alloys is 1.1 x $10^{-3}$ Ω-cm. The dimension of thermoelectric leg is 1.35 mm × 1.35 mm × 1.65 mm. $R_{TE\text{-}i}$ = 0.01 Ω.

We further assume that the ratio of contact resistance to the resistance of thermoelectric leg is $R_{cx} / R_{TE-i} = \alpha$, so that Eq. (S1) can be rewritten as,

$$\chi = \frac{1.5+2\alpha}{1+0.02} \tag{S2}$$

Based on the data of $\chi$, the $\alpha$ and $R_{cx}$ can be calculated as a function of time. The specific contact resistance ($\Omega$-cm$^2$) can be estimated by $R_{cx}$ timing contact area (1.35mm x 1.35mm). For example, if $\alpha$ = 5%, the specific contact resistance of 9 x $10^{-6}$ $\Omega$-cm$^2$ can be obtained.