Addendum: A Nanophotonic Solar Thermophotovoltaic Device

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Eq. 1 in this Letter (and also, Eq. 1.133 in ref 2) represents the temperature required for the maximum of Planck's distribution expressed *in units of wavelength* to match the bandgap energy. However, the energy at which the maximum occurs depends on whether we consider energy flux per unit frequency range or per unit wavelength range[3,4]. A more appropriate approximation matches the maximum of Planck's distribution expressed *in units of frequency or energy* to the bandgap energy, the scaling factor in this case is 4114 K/eV.

From the experimental results presented in the paper, however, it is evident that the peak STPV efficiency for a 0.55 eV cell is reached at temperatures substantially lower than what the corrected scaling factor suggests. Thus, a match between the bandgap energy and the energy corresponding to the maximum emission does not fully determine the optimal temperature of the emitter, particularly not in the case of STPVs; factors not considered by this simple approximation, such as the thermalization losses in the cell, play a significant role. For a more complete discussion of optimal temperatures in practical STPV converters please refer to ref 5.

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References

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