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Recent Advancements on the Design of Emitters for Efficient Thermophotovoltaics. MARIAMA DIAS, University of Richmond, M. DUNCAN, T. GONG, M. HOSSAIN, S. NESS, S. MCCORMACK, M. LEITE, University of California, Davis., J. MUNDAY, University of California, Davis — In thermophotovoltaics, heat from a thermal emitter is directly converted to electricity via a photovoltaic cell. To achieve high efficiencies, the emitted spectrum must be tailored to a specific solar cell. In this work, we propose to use a thin film configuration for the emitter. Our figure of merit (FOM) is defined as the ratio of the power generated by the photovoltaic cell (P_{cell}) and the power emitted by the emitter (P_{emit}). We analyze the optimal configuration of >2000 different emitters that can operate at temperatures above 2000^{o}C. The methods implemented here apply to any photovoltaic cell. Thus, we evaluate the best emitter candidates for Si, Ge, GaSb, InGaAs, and InGaAsSb cells. Due to the ultra-high temperature operation of the thermophotovoltaic, the thermal stability and the mismatch in the thermal expansion coefficient of each material combination are discussed. Our results show that FOMs above 50% are achievable under ideal conditions. This work can shed light on high-temperature photonics, where a simple emitter design can result in higher efficient photoelectronic devices.

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