NEAR-FIELD THERMOPHOTOVOLTAIC CONVERSION BY EXCITATION OF MAGNETIC POLARITON WITH NANOSTRUCTURED DRUDE EMITTERS

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ABSTRACT. In this work, we study the effect of magnetic polariton (MP) on the conversion performance of a near-field thermophotovoltaic (TPV) system made of a nanostructured Drude grating emitter and a nanometer-thick photovoltaic (PV) cell with a lossless metal as the back reflector. It is theoretically shown that MP can be excited inside the nanometric vacuum gap and the 100-nm PV cell to spectrally enhance the heat flux above the cell bandgap. It is found that the conversion efficiency reaches from 0.7% to 12.2% when the semi-infinite InGaSb cell is replaced by an ultra-thin PV cell supported by a back reflector with the emitter temperature at 1000 K and In$_{0.18}$Ga$_{0.82}$Sb cell at 300 K separated by 200 nm. The conversion efficiency can be also further improved to 17.6% using a nanostructured Drude grating emitter over a planar emitter.