Abstract Submitted
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Embedded metal nanopatterns for near-field scattering-enhanced optical absorption MICHAEL J. BURNS, FAN YE, AARON H. ROSE, MICHAEL J. NAUGHTON, Boston College, Department of Physics, 140 Commonwealth Avenue, Chestnut Hill, MA, 02467 — Simulations of metal nanopatterns embedded in a thin photovoltaic (PV) absorber show significantly enhanced absorbance within the semiconductor, with a more than 300% increase for $\lambda = 800$ nm. Integrating with AM1.5 solar irradiation, this yields a 70% increase in simulated short circuit current density and thus power conversion efficiency (single junction $\eta = 13\%$) in a 60 nm amorphous silicon film. Embedding such metal patterns inside an absorber maximally utilizes enhanced electric fields that result from intense, spatially organized, near-field scattering in the vicinity of the pattern. Appropriately configured (i.e., with a thin insulating coating), this optical metamedium architecture may be useful for increasing PV efficiency in thin film solar cells, including offering prospects for realistic ultrathin hot electron cells.

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