Abstract Submitted
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Hot electron-generated plasmon resonance in ultrathin solar absorbers: Theory[1] JIANTAO KONG, CHAOBIN YANG, JUAN M. MERLO, MICHAEL J. BURNS, MICHAEL J. NAUGHTON, KRZYSZTOF KEMPA, Boston College — It has been proposed in a simple model calculation that hot electrons excited in a semiconductor can emit plasmons in an adjacent metallic nanostructure at very high rate, exceeding that of phonon emission [1]. We demonstrate by FDTD simulations and quantum mechanical calculations that an ultrathin solar absorber with a composite metamaterial/plasmonic collector can "hold" and make use of the excess energy of hot electrons, and thus yield PV efficiency in excess of the Shockley-Queisser limit. The composite collector has a dual function: it is designed to efficiently trap light and it is a plasmonic resonator tuned to absorb the energy of hot electrons, thus "protecting" them from phonon losses. We propose a specific structure where observation of this phenomenon can occur.

[1] K. Kempa, Phys. Status Solidi RRL **7**, 465 (2013).

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