Abstract Submitted
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Hot electron effect in ultrathin photovoltaic junctions T. KIRKPATRICK, K. KEMPA, M.J. NAUGHTON, Z.F. REN, A. HERCZYNSKI, Y. GAO, Boston College, J. RYBCZYNSKI, Solasta Inc. — The open circuit voltage in nanoscopically-thin *p*-*i*-*n* amorphous silicon solar cells is found to increase with optical energy (light frequency) [1]. We accredit this increased V_{oc} to the extraction of hot carriers. The ultrathin nature of these junctions also leads to a large electric field, reducing carrier recombination and facilitating anomalously large current in addition to the increased voltage. The large J_{sc} thus indicates improved carrier extraction despite reduced optical absorption for ultrathin absorber layers. The overall power conversion efficiency is $\sim$3% with absorbers less than $1/20^{th}$ as thick as conventional *a*-Si solar cells (*i*-layer as thin as 5 nm). A simple phenomenological argument provides a semi-quantitative understanding of these effects, and may provide guidance for the design of high-efficiency, hot electron solar cells. MJN, KK and ZFR also at Solasta Inc.

[1] K. Kempa, M.J. Naughton, Z.F. Ren, A. Herczynski, T. Kirkpatrick, J. Rybczynski, Y. Gao, Appl. Phys. Lett. (in press).

Michael Naughton
Boston College

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