## Abstract Submitted for the MAR15 Meeting of The American Physical Society

**Photovoltaic efficiency of an indirect bandgap material** MICHELLE TOMASIK, NIALL MANGAN, JEFFREY GROSSMAN, MIT — Photovoltaic materials with direct band gap transitions absorb light more readily than those with indirect gaps, allowing for thinner devices. However, direct bands also suffer faster rates of radiative recombination than indirect bandgap materials. Some novel photovoltaic absorber materials, such as tin sulfide, have both direct and indirect gaps. Such materials raise the question of whether the multiple energy states benefit or harm device efficiency. We develop a model for current in a device with direct and indirect band gaps using detailed balance, similar to the Shockley-Quiesser model for direct band photovoltaics. We explore the effects of the following on device performance: transition probability of carriers between the direct and indirect state, and relative transport rate in each band.

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Date submitted: 12 Nov 2014

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