Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Non-radiative Recombination in Intermediate Band Photovoltaics[1] JACOB KRICH, ALÁN ASPURU-GUZIK, Harvard University — Intermediate band photovoltaics (IBPV) promise to absorb low energy photons while maintaining large open circuit voltages, breaking the Shockley-Queisser efficiency limit. Proposals for IBPV include hyperdoping semiconductors with impurities forming mid-gap states, creating a band entirely contained inside the larger semiconductor bandgap. For such devices to function, the electronic states in the middle of the band gap must be extended and thus not contribute to multiphonon recombination. Since the intermediate band is produced by randomly placed impurities, however, there is an inherent disorder in the electronic structure, which produces localized states inside the band gap due to Anderson localization, even at high impurity concentrations. We use a finite size scaling analysis to find the localization properties of a non-interacting intermediate band and its resultant contribution to non-radiative recombination.

[1]We acknowledge support from the Harvard University Center for the Environment.

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Date submitted: 18 Nov 2010 Electronic form version 1.4