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Physical effects of ultrathin photovoltaic junctions T. KIRKPATRICK, K. KEMPA, M.J. NAUGHTON, Boston College — Hot carrier photovoltaic cells have potential to increase conversion efficiency beyond the Shockley-Queisser limit. In addition to implementing selective energy filters into the device in order to extract the hot carriers at elevated energies beyond the band edges, a possible requirement, of particular importance for non-crystalline material, is that the device also be constructed ultrathin in order to extract the hot carriers as usable energy on time scales of less than one picosecond, after which thermalisation sets in. Ultrathin amorphous silicon p-i-n junctions have been shown to extract hot carriers as usable energy at fixed short circuit current density for p- and n- region thicknesses of 5 nm, and i-layer thickness less than 50 nm [Appl. Phys. Lett. **95**, 233121 (2009)]. Physical effects on device performance in ultrathin cells, such as optical absorption, scattering, band structure, and transport are discussed.

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