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Importance of Interfacial Dephasing in Plasmonic Resonant Energy and Hot Carrier Transfer SCOTT CUSHING, ALAN BRISTOW, NIANQIANG WU, West Virginia University — The tunable absorption and scattering cross section of plasmonics has made it ideal for enhancing solar energy conversion. The plasmon can increase photoconversion in a semiconductor by trapping light through multiple reflections, transferring the hot electron and holes from the metal to the semiconductor, or exciting interband transitions in the semiconductor by resonant energy transfer. The enhancement mechanisms have so far been understood in terms of the plasmon's resonance energy and hot spots, considering the semiconductor and plasmon as separate systems. Herein, we use a combination of transient absorption spectroscopy, action spectrum photocatalysis, and a density matrix model to show the effects of interfacial dephasing and coupling between the plasmon and semiconductor must also be included to explain the currently lower than predicted performance of plasmonic devices [1]. Accounting for these effects, how efficient plasmonic solar energy conversion can be obtained will also be discussed.

[1] Li et al, Nat. Photonics 9, 601 (2015)

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