Spatially mapping plasmonic energy transfer via STEM/EELS

Scientific Achievement

A new method to spatially map plasmon-semiconductor energy transfer at the nanoscale

Significance and Impact

Nanometer scale imaging of plasmonic energy flow in solar-harvesting devices, suggests new materials and device geometries.

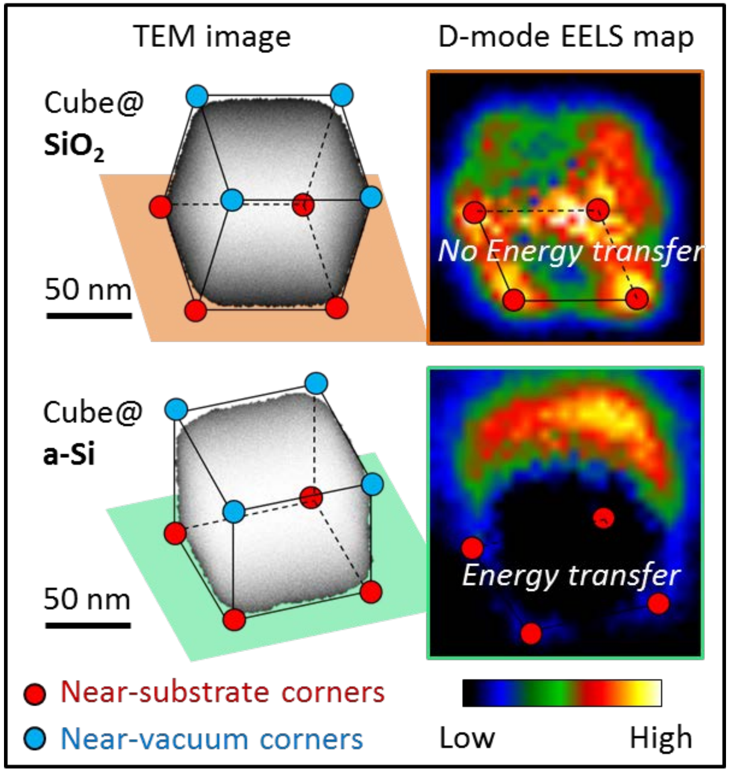
Research Details

– 3D STEM/EELS experiments are performed on nanocube@substrate systems to reveal both spectral and spatial signatures of energy transfer

– Combined experimental and theoretical results disentangle electron-transfer and resonant energy transfer mechanisms with nanometer spatial resolution

– By varying the electronic and optical property of the substrate while monitoring the EELS spectra, plasmonic energy transfer can be examined.

G. Li, C. Cherqui, N. Bigelow, G. Duscher, P. Straney, J. Millstone, D. M. Masiello, J. P. Camden, *NanoLetters*, in press (2015). *DOI: 10.1021/acs.nanolett.5b00802*



Mapping energy transfer in Ag nanocube@substrate systems: The EELS map of the dipole (*D*) mode in the cube@SiO_2 system shows strong substrate-localization, indicating that no energy transfer occurs at the interface. In contrast, the near-zero EELS signal at the cube@a-Si interface is the signature of energy transfer.

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Work was performed at University of Notre Dame and University of Tennessee