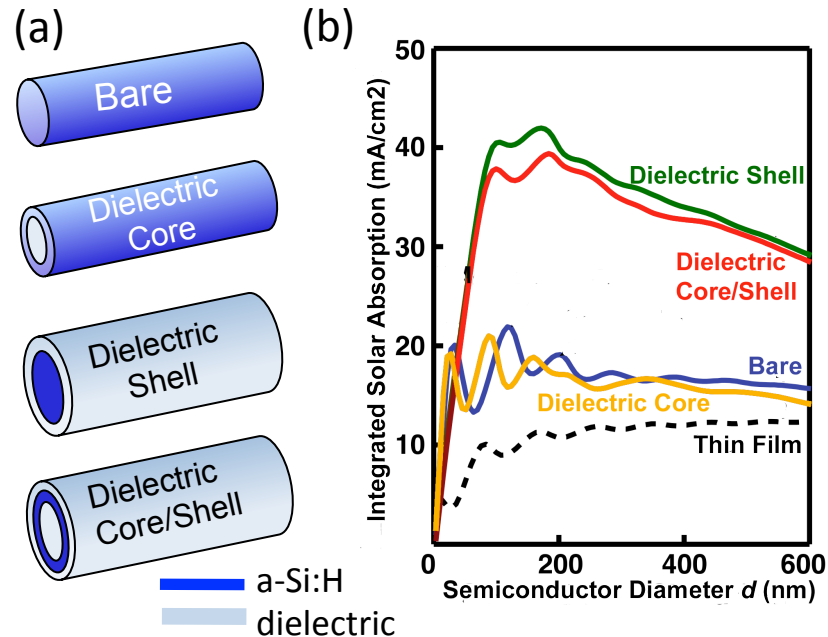


Dielectric Optical Antennas for Solar Absorption Enhancement



Scientific Achievement

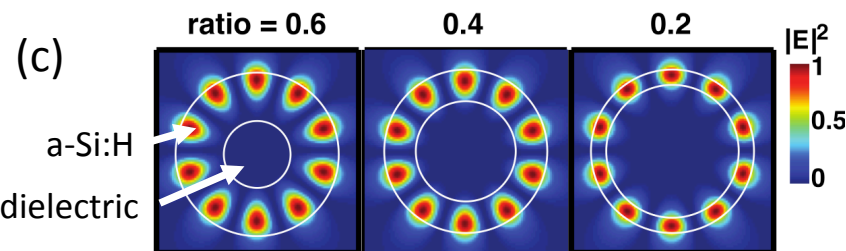
Calculations show that the optical absorption of a-Si:H nanowires can be enhanced and designed with dielectric optical antennas.

Significance and Impact

The total volume of a-Si:H needed for effective solar absorption can be reduced significantly with the use of dielectric antennas, potentially improving efficiency and stability and reducing cost.

Research Details

- Semiconductor nanowires support localized Mie resonances, which result in resonant absorption modes
- We compare four different cases, and show that replacing the core of the nanowire with a nonabsorbing dielectric does not significantly perturb the modes, maintaining high absorption. Adding an antireflection coating to the outside of the wire also improves the response, and the two can be combined to reduce the total volume of semiconductor required.



Calculated optical absorption weighted by the solar spectrum in core-shell nanowires of various geometries consisting of a-Si:H semiconductor and a dielectric with $n=2$

Work was performed at Lawrence Berkeley National Lab and North Carolina State University

Y. Yu, V. E. Ferry, A. P. Alivisatos, L. Cao.
Nano Letters, 12 (7), 3674-3681 (2012).