Solar highways: core-shell nanowires for high-efficiency, low-cost solar cells

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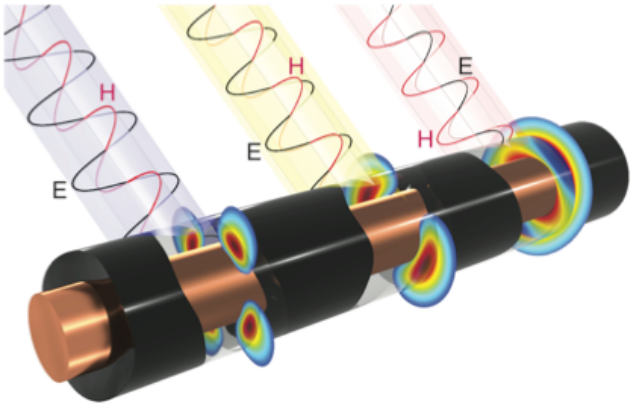
The ideal solar cell would convert light into electricity in an infinitely small volume. Such a structure not only limits material usage but also relaxes carrier diffusion length requirements and maximizes the output voltage. Here we describe a novel solar cell geometry consisting of a metal nanowire covered by an ultrathin semiconductor layer, which shows extreme light absorption enhancement.[1] We present a theoretical model to explain why this structure works so well in both polarizations of light and use full-field simulations to demonstrate robust performance even with geometrical perturbations. We begin experimental work with a model system consisting of a silver nanowire core and cuprous oxide shell. These core-shell nanowires are synthesized at low temperature in solution and here we will present electron microscopy showing that they are single-crystalline with atomically sharp and coherent interfaces. Finally, we will present spatially-resolved optical measurements (reflection, scattering, absorption) taken on single nanowires using an integrating sphere.



[1] S.A. Mann and E.C. Garnett, *Nano Letters*, **13**, 3173, (2013).