Record efficiency in NIR-to-visible photon upconversion

October 2016 Research Highlight

**Scientific Achievement**

Demonstrated record performance by addressing a fundamental problem in near-infrared-to-visible upconverting nanoparticles, proving a path toward low-cost, high-efficiency single-junction solar cells.

**Significance and Impact**

Lanthanide-based NIR-to-visible upconverters have low efficiencies due largely to the parity-forbidden nature of $f$-$f$ optical transitions. Here, we overcome this limitation by distorting the host lattice and in so doing achieve a record upconversion efficiency.

**Research Details**

- Synthetic cosubstitution engenders local distortions which make the $f$-$f$ transitions comprising UC more probable
- Slight cosubstitution yields a 1.6x quantum yield boost
- Concurrent lifetime drop evinces probability increase
- Additional characterization confirms symmetry distortion as the source of the UC quantum yield enhancement