A Path to High-Concentration Luminescent Solar Concentrators with Nanorod Lumophores and Micro-Silicon Solar Cells

Scientific Achievement
We fabricated and modeled luminescent solar concentrators (LSCs) incorporating micro-silicon solar cells and tunable CdSe/CdS nanorod lumophores, demonstrating a practical path to operation in the high-concentration regime.

Significance and Impact
LSCs enable non-tracking concentration of both direct sunlight and diffuse light onto high-efficiency solar cells, and our work predicts unprecedented levels of concentration in these devices.

Research Details
• Large CdSe/CdS nanorods reduce photon reabsorption in the LSC.
• An accurate Monte-Carlo ray-tracing model predicts a feasible path to high concentration of diffuse radiation.
• Calculations show that a simple Bragg mirror traps >99% of the luminesced light.
• High nanorod luminescence quantum yield, efficient luminescence trapping, and long propagation distances are all required in order to achieve high concentration.


Work was performed at UC Berkeley, UIUC, and LBNL