Achievement:
We have shown that maximizing light emission is the key to approaching the Shockley-Queisser fundamental efficiency limits. Fluorescence efficiency is therefore crucial in selecting a material system. Even with the best materials, the highest efficiencies cannot be achieved unless the solar cell is also designed as a good LED.

Significance:
From single-junction cells to novel third-generation devices, our analysis will guide solar cell design. As applied to GaAs cells, we predict 30% efficient single-junction, flat-plate solar cells in the near future.