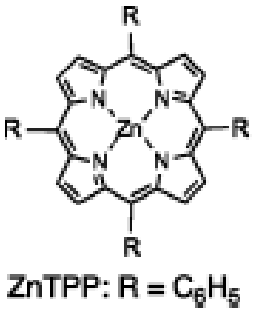
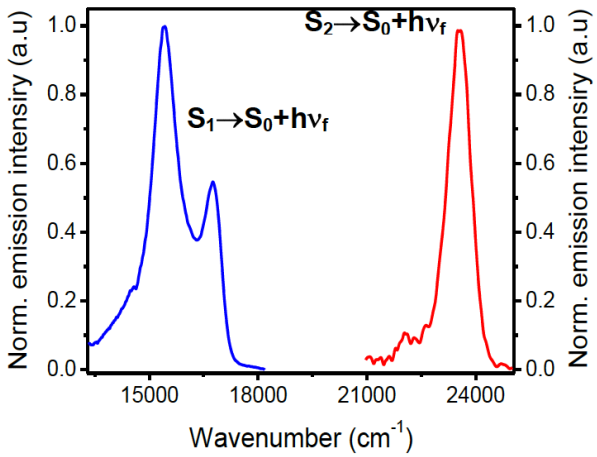
Photoluminescence Upconversion in Solution and Solid-State Via Triplet-Triplet Annihilation

M.F. Paige, R.P. Steer, Department of Chemistry, University of Saskatchewan, Saskatoon, Canada.

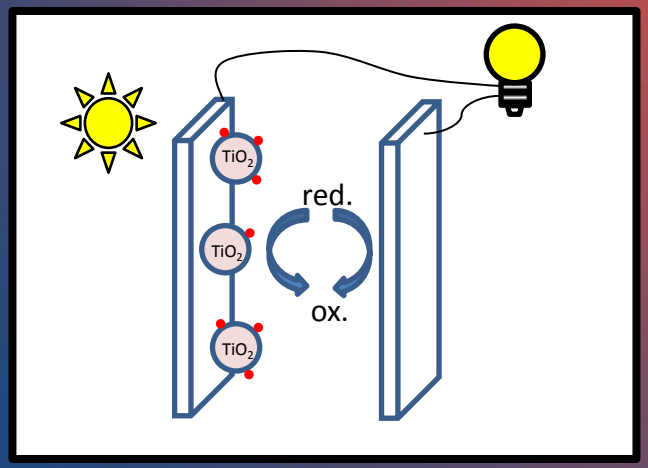
Dye-sensitized solar cells are a potential breakthrough technology for *efficient solar energy conversion*. Our ultimate goal is to improve conversion efficiency through the use of photophysical processes called **triplet-triplet annihilation** and **fluorescence upconversion**. This will allow more effective conversion of near-infrared light in solar cells.

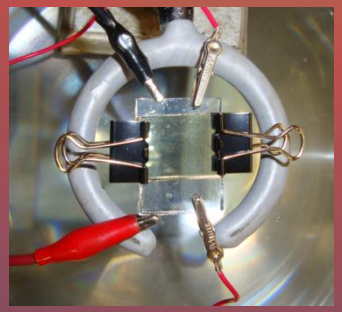


ZnTPP: R = C_6H_5



In triplet-triplet annihilation, low energy red photons are converted into high energy blue photons which can be more effectively used by solar cells. We have demonstrated upconversion in solids and solutions using a simple metalloporphyrin as well as various porphyrins mixed with "antenna" molecules to enhance performance. Detailed mechanistic understanding of the process will lead to improved power conversion efficiency.





A porphyrin-sensitized solar cell
Thunder, Steer, Paige et al., Unpublished results