Abstract Submitted
for the 4CF14 Meeting of
The American Physical Society

Tunable band gaps of protein enclosed nanocrystals for high efficiency solar energy conversion[1] STEPHEN ERICKSON, TREVOR SMITH, RICHARD WATT, JOHN COLTON, Brigham Young University — Multi-junction solar cells increase efficiency limits on solar energy conversion by breaking up the incident spectrum to be absorbed by layers of different semiconductors. However, such devices have a limited library of compatible materials due to the need for lattice matching between the different layers. The spherical protein shell ferritin is used as a template for synthesizing a wide variety of nanocrystals, mitigates the effects of photocorrosion, and may act as a structural interface between different layers of a multi-junction solar cell. By controlling the size and chemical composition of the enclosed nanocrystals, band gaps ranging from 1.60 to 2.29 eV can be synthesized. A detailed balance model for a current matched multi-junction solar cell using these materials with a silicon substrate gives maximum efficiencies of 41.6% for unconcentrated sunlight and 50.0% for maximally concentrated sunlight.

[1]This work was supported by the Utah Office of Energy Development under the Governor's Energy Leadership Scholars Program

Stephen Erickson
Brigham Young University

Date submitted: 02 Sep 2014 Electronic form version 1.4