Comparing and contrasting: photosynthesis and semiconductor (based solar cell har...

In total, the sun provides 2 x 105 terawatts (TW), much greater than the 13 TW harnessed and used by humans (Crabtree and Lewis, 2007, p. 37). Plants, through photosynthesis, convert 0. 3% of harnessed sunlight to useful energy. This useful energy is chemical, in the form of biomass, which is still further processed to provide electricity. Briefly, sun rays excite the electrons to a higher energy level. Because this form unstable, the excited electrons goes through a stepwise electron transfer, which harnesses the released energy, in the form of adenosine triphosphate (ATP), much more efficient than a one-step reaction. ATP is then used to use CO_2 to form organic compounds such as starch, amino acids, and fatty acids. The green color of leaves means that all the colors in the light spectrum is harnessed for energy, except for green. (Campbell and Reece, 2002, p. 186, 194). Since natural systems cannot be altered to make them efficient, all that can be done at present is use genetically-modified plants that can grow faster to provide more photosynthetic units, although linking the efficient part of photosynthesis to artificial systems that replace the inefficient steps of photosynthesis is a possibility (Crabtree and Lewis, 2007). The efficiency of commercial solar energy-acquiring cells made of inorganic single-crystal silicon now ranges from 2-18%. Similar to plants, energy from photons are transferred by exciting electrons. The efficiency of its energy-harnessing ability is limited by the structure of the solar cells. Currently, as is the case in plants, one electron is excited per photon. In addition, solar cells harness sunlight through a flat surface that does not permit concentration of sun rays. Moreover, the semiconductors limit the energy absorbed to a part of the spectrum. Improvements on solar cells itself, in contrast to natural systems, can be done to make solar energy harnessing more efficient. In particular, nanotechnology can increase the number of electrons excited by a photon and the proportion of light spectrum absorbed by the solar cells. Unlike plants, its output is readily usable as electricity (Crabtree and Lewis, 2007). References Campbell, N. A., & Reece, J. B. (2002). Biology (6th ed.). San Francisco, CA: Benjamin Cummings. Crabtree, G. W., & Lewis, N. S. (2007). Solar Energy Conversion. Physics Today, 37-42.