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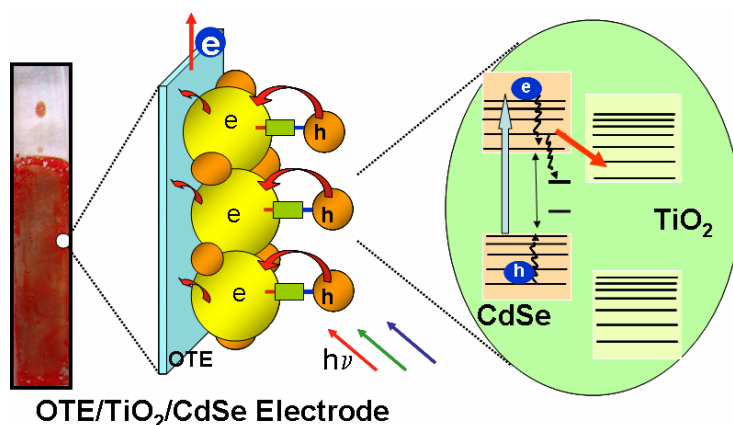
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April 3, 2006

Use quantum dots as light-harvesting “antennae”. Ordered assemblies of semiconductor nanoparticles with narrow band gaps have been used to harvest visible light energy in photoelectrochemical cells. However, the photocurrents obtained from these assembly systems are often low because fast charge recombination limits photocurrent generation.

M. Kuno, P. V. Kamat, and co-workers at the University of Notre Dame (IN) have prepared a semiconductor heterojunction structure by linking two kinds of nanoparticles with tailored band offsets through a group of bifunctional surface modifiers. This assembly exhibits high photon-to-charge carrier generation efficiency.



CdSe quantum dots (average ~4 nm diam; shown in orange) were assembled onto mesoporous films of TiO₂ nanoparticles (average ~50 nm diam; yellow) with the aid of bifunctional surface modifiers (green). In this case, the modifier was HSCH₂CH₂COOH. Upon visible-light excitation, the CdSe nanodots inject electrons from their conduction bands into the TiO₂ nanoparticles with rates of 7.3–195 x 10⁹ s⁻¹. When the CdSe–TiO₂ nanocomposite is used as a photoanode in a photocell, it exhibits a photocurrent generation efficiency as high as 12%.

(*J. Am. Chem. Soc.* **2006**, *128*, 2385–2393; [Ben Zhong Tang](#))