

Harnessing long wavelength solar energy based on Upconversion Assisted hybrid Photocatalysts for Energy/Environmental Applications

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One of the biggest problems in solar photocatalysis for energy and environmental applications is the ineffective light absorption of photocatalysts, especially for low energy photons in the visible and infrared light range, resulting in the limitation of the photocatalytic activity. Therefore, it is desirable to seek an effective way to provide photocatalysts with sufficient light absorption. Herein, we introduce a new strategy, named as upconversion, to more effectively harness low energy photons on photocatalysis in a different manner. Upconversion is the anti-Stokes photoluminescence process to amplify the frequency of low energy photons through second harmonic generation, simultaneous two-photon, and triplet-triplet annihilation. Triplet-triplet annihilation upconversion (TTA-UC) through the multiple energy transfers between sensitizer and acceptor organometallic molecules provides the most promising efficiency under noncoherent light and low light intensities. A couple of examples for the combination of photocatalysis and TTA-UC for both energy and environmental applications will be introduced.