# Using Pico-Nano Technology to Enhance the Effectiveness of Visible-Excited Charge Separation and Photo-catalytic Activity

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Worldwide interests aroused in the field of solar water splitting and photodegradation of organic pollutants using semiconductor photocatalysts. Fabrication of nano photocatalyst can improve the activity, as high surface areas are exposed to interfaces and many surface sites are made available to promote redox reactions. BiVO4 has received great attention in this regard since it has a good capability of harvesting the visible light, having high stability, suitable band gap (2.45 eV) and theoretical high efficiency (9.1%). Moreover, its valence band edge (?2.4 VRHE) provides a strong driving force for oxidation by photogenerated holes. However, the activity of BiVO4 is still not impressive as it suffers from excessive electron-hole recombination, poor charge transport property and oxidation kinetics. The reason has been the relatively short electron diffusion length of undoped BiVO4 (ca. 10 nm), whereas for efficient charge separation particles size less than 10 nm is needed to enable the electrons reach interfaces before recombination. This present research endeavor has made possible a new cost-effective hydrothermal synthetic course to produce self-assembled pico-nano crystals of BiVO4 under low temperature. As a result, ultra-thin particles of Pico-Nano BiVO4 less than 1 nm were obtained, whereby enhanced efficiency for charge separation leading to non radiative recombination, ultra-high surface area and potential photo-catalytic activity were realized . This promises a vast variety of applications and potential solutions to our global energy and environmental challenges.

**Awards Won:**