

# The Role of Alcoholic Sacrificial Agents in Photo-Catalysis: Is it Always Trivial?

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Photo-catalytic hydrogen production is proposed as a sustainable energy source. Simultaneous reduction and oxidation of water is a complex multistep reaction with high over potential. Photo-catalytic processes involving semiconductors transfer electrons from the conduction band to the valence band. Sacrificial substrates that react with the photo-chemically formed holes are often used to study the mechanism of H<sub>2</sub> production, as they scavenge the holes and hinder the charge carrier recombination. The desired sacrificial agent is one forming a radical that is a fairly strong reducing agent and that its oxidized form is not a good electron acceptor that might suppress the HER. Methanol was found to fulfil both these requirements in the TiO<sub>2</sub>@(M<sup>0</sup>-NPs), M = Au or Pt, system. This study provides general guidelines for choosing an appropriate sacrificial substrate and helps to explain the variance in the performance of alcohol scavengers-based photo-catalytic systems.