Sathiyan Krishnamoorthy et al., J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C10-095

The role of alcohol sacrificial agents on M/TiO2 photocatalysts towards H2 production reaction: A mechanistic study

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In the reported study we explored the performance of M/TiO2 (M = Pt, Au) nanoparticles (NPs) as photocatalysts for HER (Hydrogen Evolution Reaction), with an emphasis on the role of the alcohol sacrificial reagent under light illumination. TiO2 NPs of fine particle size were produced by the controlled hydrolysis of Titanium Tetrachloride (TiCl4) as developed by Rabani et al.[1] and improved by us. The TiO2-NPs were decorated with metal NPs by the addition of the metal precursors followed by sodium borohydride reduction (NaBH4). Photocatalytic H2 production experiments were conducted in aqueous solutions of methanol, ethanol and 2-propanol under light illumination with an optimum alcohol concentration of around 2.0 M. The hydrogen production yields follow the unexpected order: methanol > 2-propanol > ethanol. The addition of acetone (2-propanol oxidation product) into the reaction system suppressed the H2 formation suggesting that the alcohol oxidation product reacts with the surface reducing agents (Hydrogen atoms, hydrides or electrons). These results give a better understanding of the role of the sacrificial reagents in HER.

Biography

Sathiyan Krishnamoorthy pursued his master's degree in chemistry from National Institute of Technology at Tiruchirappalli, India. Currently, he is a third third-year Ph.D. candidate at Ariel University, Israel. His current research work focuses on Investigation of mechanisms for Hydrogen evolution reaction with different nanoparticles and improving their catalytic activity.

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