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Biomimetic Hydrogen Evolution via Water Splitting in Solid State

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Hydrogen production from photocatalyst using visible light is an ideal way to acquire environmentally clean and renewable energy source for future. Natural photosynthesis has been considered as one of the most efficient mechanisms converting solar energy to other energy source. Here, we report a novel strategy to generate H_2 fuel in large scale via artificial Z-scheme mechanism as mimicking efficient natural photosynthesis in green leaves. Two visible light sensitive photocatalyst having different band structure were combined for achieving Z-scheme mechanism. Their combination (Pt/CdS/Au/C-TiO_2) can successfully transfer photogenerated electrons to higher energy level as drawing alphabet 'Z' . It can lead to produce about 5 times higher amount of H_2 under the irradiation of visible light than that of CdS/Au/TiO_2, which is representing sensitizing technique. Furthermore, we tried to combine CdS and Ag_3PO_4 for enhancing the production of hydrogen. It was reported that Ag_3PO_4 exhibited excellent photocatalytic oxidative performance of Ag_3PO_4 under the irradiation of the visible light. The larger production of photo-excitons in Ag_3PO_4 can reduce the probability of charge recombination, subsequently is expected to enhance the production of hydrogen. Although its instability problem is remained to be solved at the future, the findings reported herein present innovative route toward energy harvest mimicking natural photosynthesis, independent of fossil fuels.