

Photocatalytic H₂ generation by colloidal SiNCs and SiNC-[FeFe] complex

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In this study, we demonstrated photocatalytic hydrogen (H₂) generation by ligand-passivated Si nanocrystals (SiNCs) and SiNC-[Fe-Fe] complexes. Si is regarded as a promising candidate photocatalyst material since Si is abundant, cheap, and nontoxic. Prior to test photocatalytic H₂ generation, we examined size-dependent photocatalytic activity of SiNCs in polar solvents using methylviologen (MV²⁺). We also firstly demonstrated size-dependent photocatalytic water splitting using SiNCs in the presence of ascorbic acid (AA) as sacrificial reagent. With the best of our knowledge, this is the first study to show photocatalytic H₂ generation using SiNCs. In order to enhance photocatalytic activity of SiNCs, we fabricated SiNC-[Fe-Fe] complex. [Fe-Fe] is a kind of the most active bio-inspired catalyst with fascinating turnover frequency (TOF) and is expected to show excellent catalytic activity with SiNCs due to extremely long life time of excitons in SiNCs. In conclusion, we successfully investigated size-dependent photocatalytic H₂ generation by SiNCs and SiNC-[Fe-Fe] complexes.