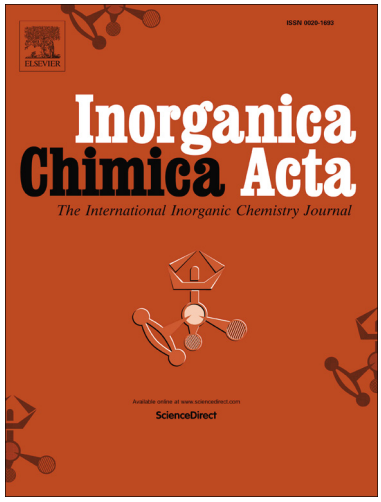

Research paper

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Preparation, Characterization and Photocatalytic Properties of Diiron Mimic Modified Nano Silica†

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Abstract: Diiron mimic modified Nano Silica(**1**) was synthesized in three steps. The intermediate(**2**, **3**) and final product(**1**) were characterized by SEM(EDX), elemental analysis, FT-IR, XRD, TG-DTA and AAS. The diiron mimic modified Nano Silica(**1**) could be considered as a new heterogeneous [FeFe]-hydrogenase model. In addition, **1** was applied to a photocatalytic hydrogen production system which made up of photosensitizer($[Ir(ppy)_2(bpy)]PF_6$), electron sacrifice(TEA), proton source(H_2O) and solvent(acetonitrile). The turnover number was 324 for surface modified catalyst and 60 for photosensitizer in 5 hours of illumination. The study of the recovered catalyst found that most of the catalysts were broken down within 5 hours of catalytic reaction.

Keywords: Nano Silica, Surface Modification, Hydrogenase model, Photocatalytic hydrogen production.

1. Introduction

Fossil fuels are about to be exhausted in the next few decades. Scientist are trying to find alternatives to fossil energy. It is widely accepted that hydrogen is an ideal energy carrier[1] to replace them. Actually, hydrogen powered vehicles are being developed and are expected to replace gasoline powered vehicles. However, to make hydrogen our major energy source practicably, we must produce hydrogen with low cost and sufficient efficiency firstly. But so far, this has been a great challenge for us. As far as we know, the vast majority of H_2 is produced by the cracking reaction of methane[2]. This method consumes fossil fuels and additional energy, even accompanied by carbon dioxide emissions . So this method of hydrogen production is not sustainable and almost meaningless in terms of energy efficiency. In contrast,

* Corresponding author. †Electronic supplementary information (ESI) available: Other magnification of SEM images of nanoparticles, Fig. S1 for **1**, Fig. S2 for **2**, Fig. S3 for **3**, Fig. S4 for Nano silica; XRD of nanoparticles Fig. S5.
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