Supporting information

Visible light driven H₂ production in molecular systems employing colloidal MoS₂ nanoparticles as catalyst

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**Experimental details**

2 wt% MoS$_2$/Al$_2$O$_3$ catalysts used in the reactions were prepared according to the following two methods. (1) Al$_2$O$_3$ was impregnated with (NH$_4$)$_6$Mo$_7$O$_24$·4H$_2$O aqueous solution followed by calcination at 500°C for 4 hrs. The as prepared MoO$_3$/Al$_2$O$_3$ precursor was then sulfurized in a 10 vol% H$_2$S/H$_2$ (v/v) flow at 400°C for 2 h. (2) Al$_2$O$_3$ was impregnated with (NH$_4$)$_2$MoS$_4$ aqueous solution followed by sulfidation in a H$_2$S flow at 350°C for 2 h.

The photocatalytic reactions were carried out in a Pyrex reaction cell connected to a closed gas circulation and evacuation system. 150 ml of 2:1 acetonitrile/methanol solution containing different amounts of Ru(bpy)$_3^{2+}$, 0.01 mol H$_2$A and 12.5 μmol of freshly prepared colloidal MoS$_2$ was used in the reactions. For comparison, K$_2$PtCl$_4$ was also used as catalyst instead of colloidal MoS$_2$ in the reactions. The reaction solution was thoroughly degassed and then irradiated by a Xe lamp (300 W) which is equipped with an optical filter ($\lambda > 420$ nm) to cut off the light in the ultraviolet region. The amount of H$_2$ produced was analyzed using an on-line gas chromatography.
Fig. S1 TEM images of 0.15 mM colloidal MoS$_2$ nanoparticles prepared at 423 K.