ESI

$Ru^{III}(edta)]$ ($edta^{4-}$ = ethylenediaminetetraacetate) mediates photocatalytic conversion of bicarbonate to formate over visible light irradiated non-metal doped TiO_2 semiconductor photocatalysts

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S1. Surface modification of TiO_2 semiconductor particles with $[Ru^{III}(edta)]$ catalyst complex

Surface modification of TiO_2 semiconductor particles with $[Ru^{III}(edta)]$ catalyst complex was achieved by the following procedure. TiO_2 powder (500 mg) was added into an aqueous solution of $[Ru^{III}(edta)]$ complex (1.0 mM). The resulting solution was stirred magnetically for over 5 h, to allow the complex to adsorb onto the TiO_2. The pH of the mixture was kept at 5.0 (by using 0.1M HCl / 0.1M NaOH). It was then filtered, washed twice with distilled water and dried at room temperature. The uptake of the $[Ru^{III}(edta)]$ complex by the surface of TiO_2 was estimated spectrophotometrically by measuring the difference in absorbance of free $[Ru^{III}(edta)]$ complex in aqueous solution with that of the supernatant liquid obtained after filtration, which was found to be 3.20 µmol/g. For C-TiO_2, N-TiO_2 and S-TiO_2 samples, the values of $[Ru^{III}(edta)]$ uptake are 3.11 µmol/g, 3.17 µmol/g and 3.22 µmol/g, respectively.

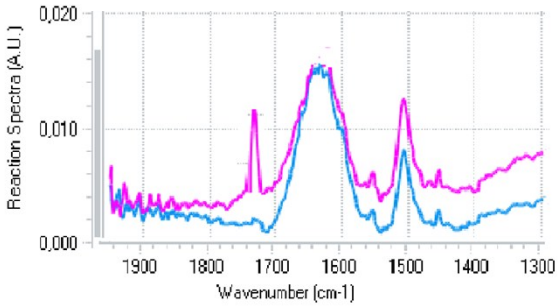

Fig. S1 IR Spectra of (——) Ru(edta) complex and (——) Ru(edta) adsorbed in TiO_2 surface

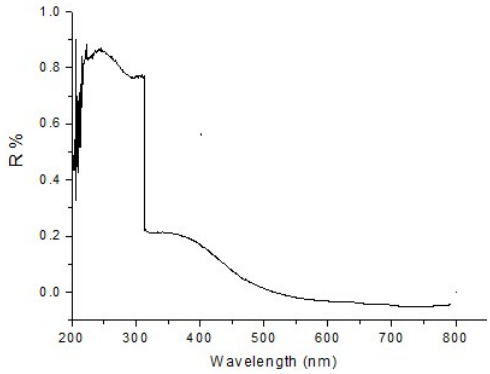

Fig.S2 . Diffuse reflectance spectra of the catalyst sample collected (by filtration) after the completion of the catalytic reaction.

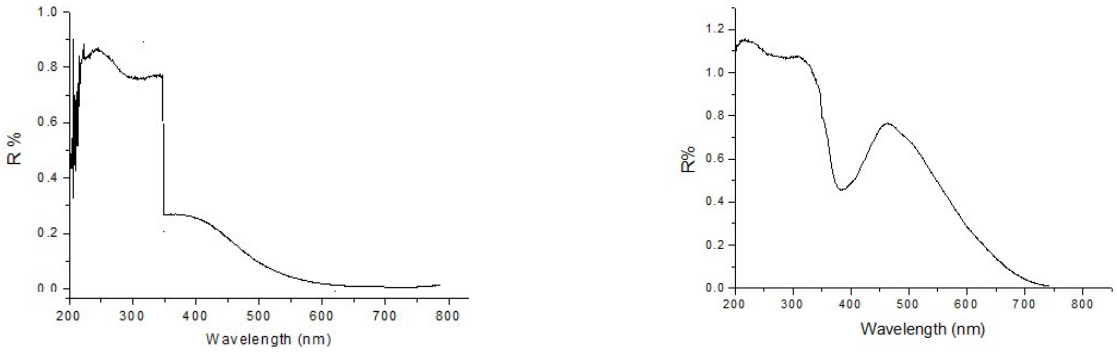

Fig.S3 . Diffuse reflectance spectra of (a) [Ru^{III}(edta)pz)] surface adsorbed TiO_2 and (b) [Ru^{II}(edta)pz)] surface adsorbed TiO_2 semiconductor photocatalysts.