Electronic Supplementary Information (ESI)

Visible light driven non-sacrificial water oxidation and dye degradation with silver phosphates: multi-faceted morphology matters

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Chemicals: All the chemicals were purchased from Sigma-Aldrich and used as received without further purification. Double distilled water was used for the experiments.

Instruments: Powder XRD was recorded in Bruker AXS D8 advanced automatic diffractometer equipped with a position sensitive detector (PSD) and a curved germanium (111) primary monochromator. The radiation used was Cu-$K\alpha$ (λ = 1.5418 Å). SEM images were taken in LEO DSM 982 microscope integrated with EDX (EDAX, Appollo XPP). UV-vis spectroscopy was measured in Lambda 35 UV/Vis spectrometer from Perkin Elmer (USA) and a Clark-type oxygen electrode system (Strathkelvin, 1302 oxygen electrode and 782 oxygen meters) was used to detect oxygen in solution.

Photocatalytic water oxidation experiments: 10 mg catalyst, 2 mL of water/ buffer solution, irradiated with 300 W Xe lamp with a cut off filter 420 nm. The amount of oxygen was detected with Clark electrode calibrated at zero ppm oxygen with sodium sulfite solution and oxygen saturated solution at 254.4 ppm. Catalyst and water/ buffer solution were placed in a glass reactor, maintained at a constant temperature of 20^{o} ± 1 C. The solution mixture was purged with argon to remove all oxygen to zero ppm at dark and then irradiated with light to initiate the reaction.

Photocatalytic dye degradation of methyl blue (MB):

100 mg catalyst was taken in 50 mL of MB solution (16 mg/L) a reactor maintained at 20^{o} ± 1 C at dark. The mixture was stirred for 15 minutes to see the effect of adsorption of MB on catalyst surface. 500 µL aliquot was taken, diluted to 2 mL, catalyst particles removed by settling down and absorbance was measured after various time intervals.

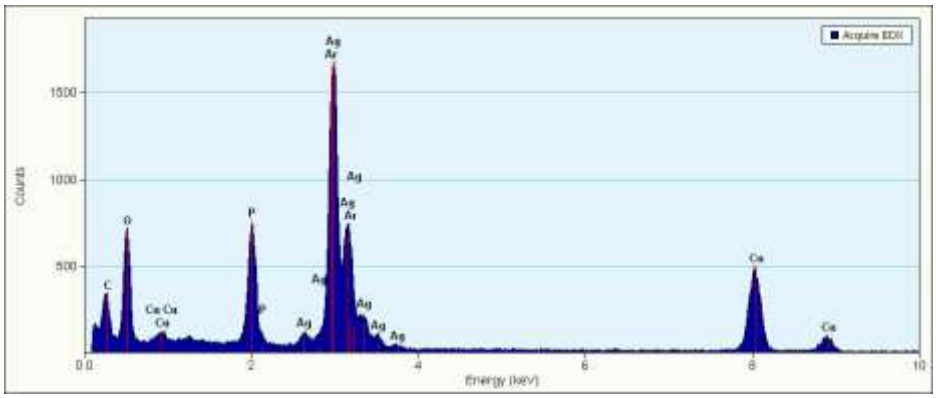

Fig. S1. EDX spectrum of Ag_3PO_4 (1) showing Ag, P and O as the only elements. Cu and C signal was from the sample holder grid.

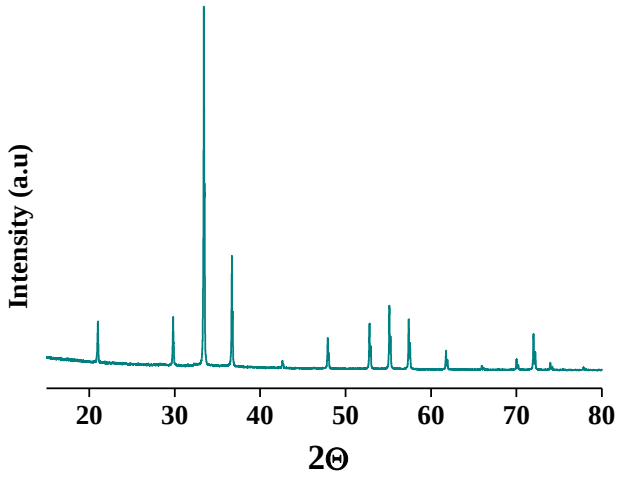

Fig S2. Powder XRD pattern of Ag_3PO_4(2).

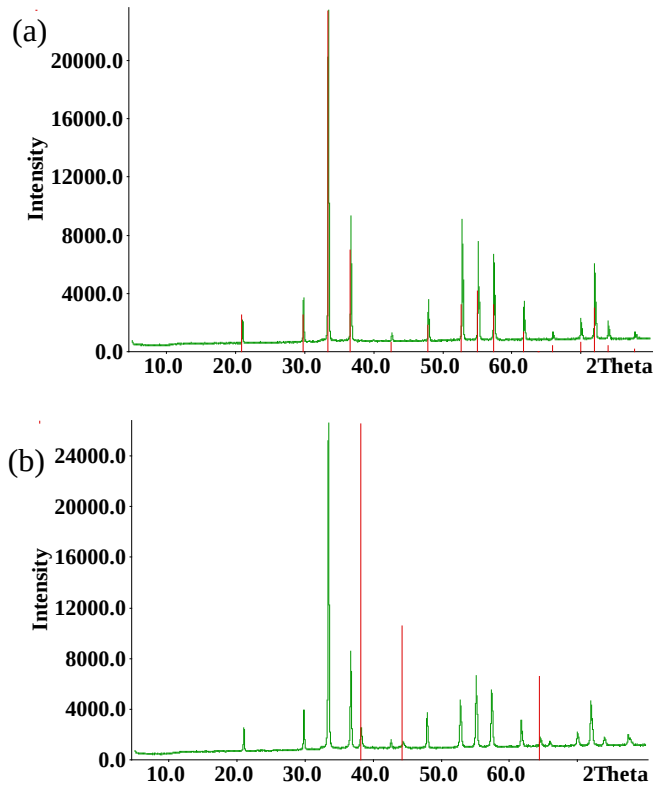

Figure S3. Powder XRD patterns of Ag_3PO_4(1) (a) after 5 minutes of photochemical water oxidation (red lines indicating the reflections of silver phosphate) and (b) after 60 minutes of photochemical water oxidation (red lines showing the reflections from metallic silver) in phosphate buffer (pH = 7.2).

Fig S4. Variation of the absorbance and color of MB with time during the degradation with Ag_3PO_4(1) under visible light irradiation (> 420 nm) at 20^o C.