Electronic Supplementary Material (ESI) for CrystEngComm

Robust $Zn_3V_2O_8$ Cubooctahedron in Gram Quantity: A Material for Photocatalytic Dye Degradation in Water

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Supporting information

Supporting information S1:

Materials

All the reagents were of AR grade. Zinc sulfate [$ZnSO_4.2H_2O$] and ammonium vanadate were purchased from E-Merck. Beakers and other glasswares (capacity 15 mL) were obtained from Blue Star India and they were properly cleaned with aqua regia, water and dried prior to their use.

Analytical Instrument

Powder X-ray diffraction (XRD) was done in a PW1710 diffractometer, a Philips, Holland, instrument. The XRD data were analyzed by using (JCPDS) software.

Reflectance spectra were measured using DRS (Diffuse Reflectance Spectra) mode with a Cary model 5000 UV-vis-NIR spectrophotometer.

All absorption spectra for the degradation reaction were recorded in a chemito spectrophotometer (India) and taking the solutions in a 1 cm quartz cuvette.

Raman spectra were obtained with a Renishaw Raman Microscope, equipped with a He-Ne laser excitation source of emitting wave length 633 nm and a peltier cooled (-70°C) charge coupled device camera (CCD).

Fourier Transform Infrared Spectroscopy i.e., FTIR measurements of the samples were done in KBr pellets in reflectance mode with a Nexus 870 Thermo-Nicolet instrument coupled with a Thermo-Nicolet Continuum FTIR microscope.

Field emission scanning electron microscopy (FESEM) was performed with a supra 40, Carl Zeiss Pvt. Ltd. Instrument, and an EDAX machine (Oxford link and ISIS 300) attached to the instrument was used to get the nanocrystal composition.

Transmission electron microscopy (TEM) was performed with an H-9000 NAR instrument, Hitachi, using an accelerating voltage of 300 kV.

Thermal decomposition behavior of the nanomaterial was tested using a TGA Q 5000 of TA Instruments at a heating rate of 10 °C/min.

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Supporting figure

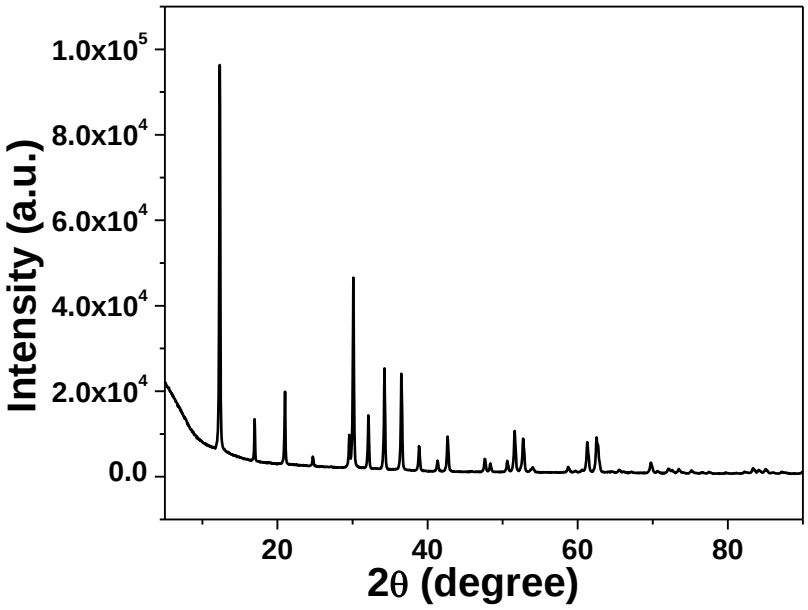

Figure S1: XRD pattern of $Zn_3V_2O_7(OH)_2(H_2O)_2$.

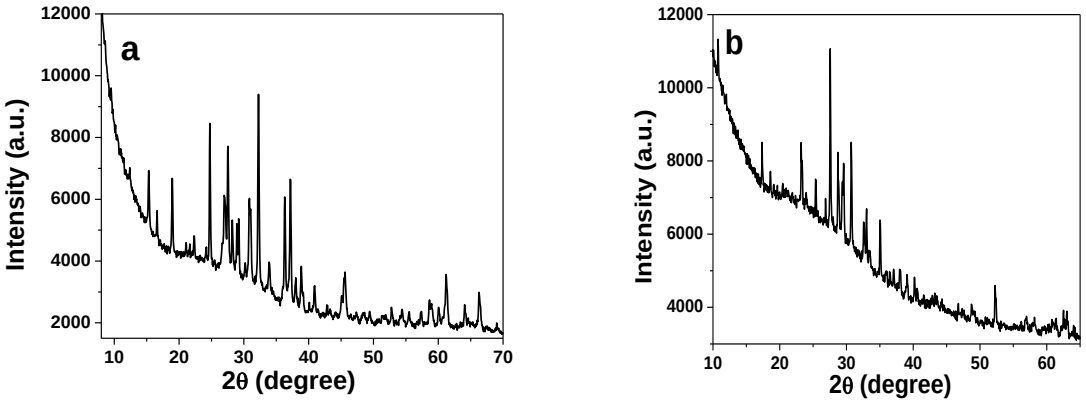

Figure S2: XRD pattern of (a) β-$Cu_3V_2O_8$, (b) $Co_2V_2O_7$ nanostructure.

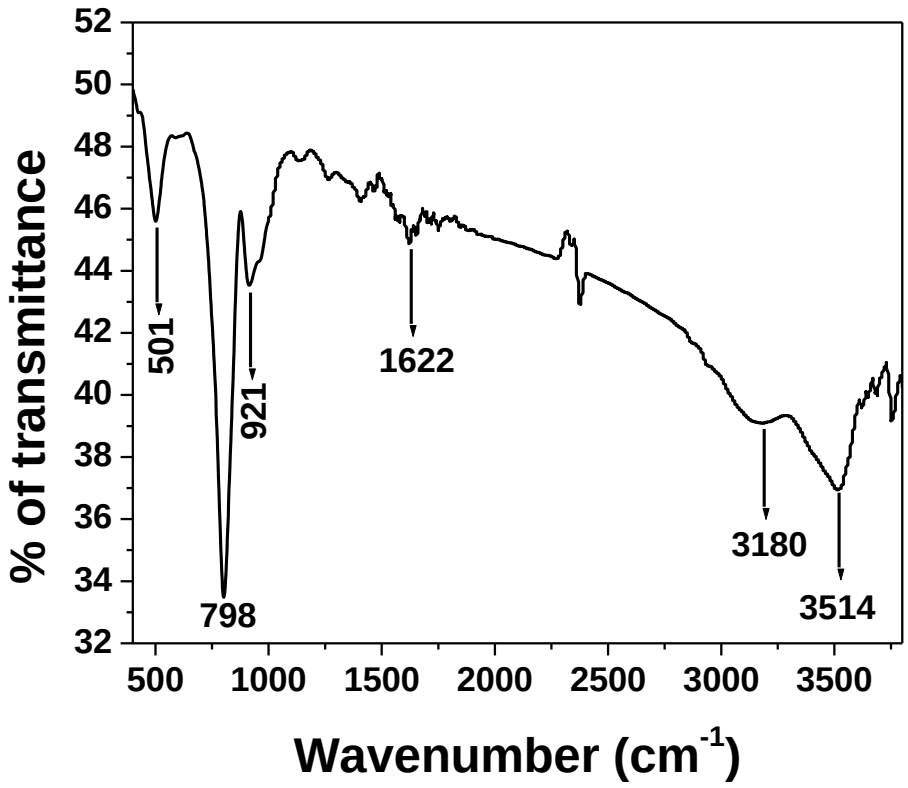

Figure S3: FTIR spectrum of $Zn_3V_2O_8$ cubooctahedron.

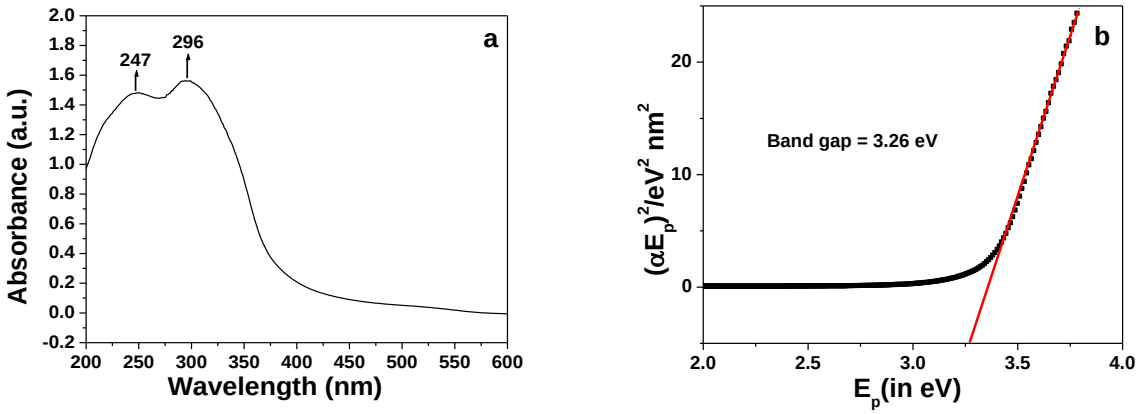

Figure S4: (a) Diffuse reflectance spectrum of $Zn_3V_2O_7(OH)_2(H_2O)_2$ (b) its corresponding band gap.

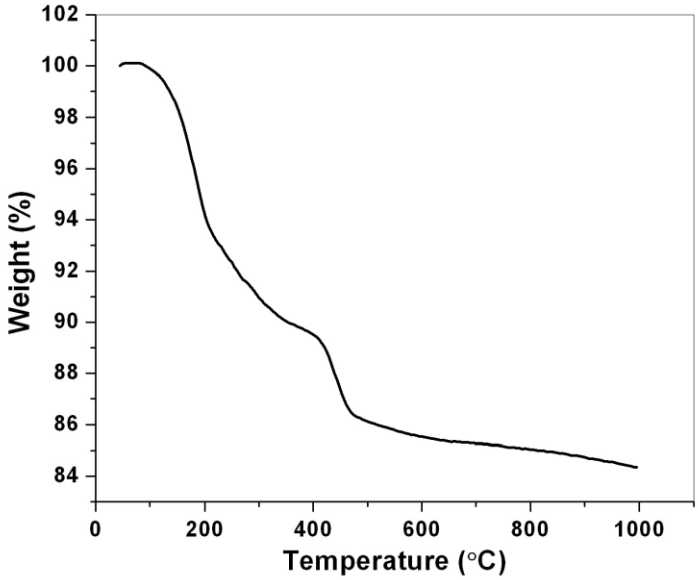

Figure S5: TGA of $Zn_3V_2O_7(OH)_2(H_2O)_2$ prepared at 70°C.

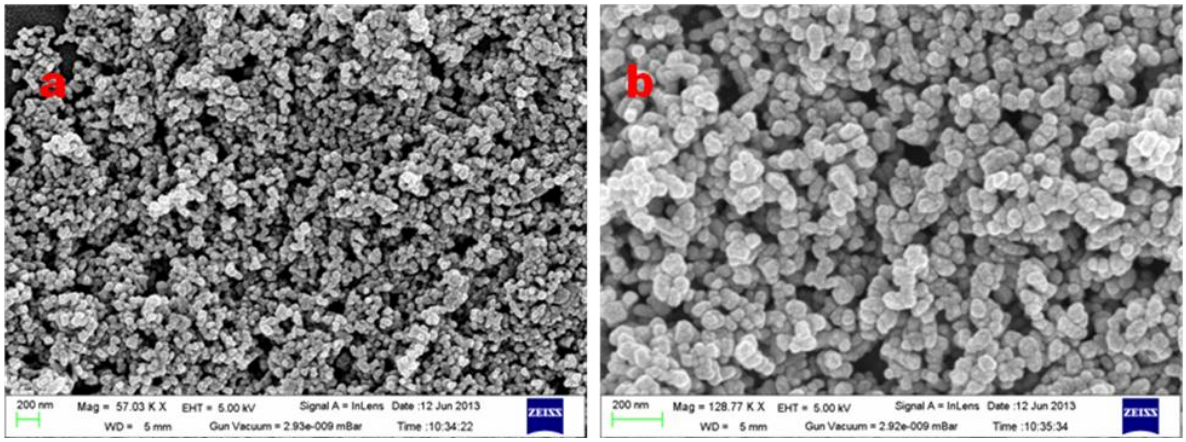

Figure S6: FESEM images of CoV_2O_7 at (a) low magnification, (b) medium magnification.

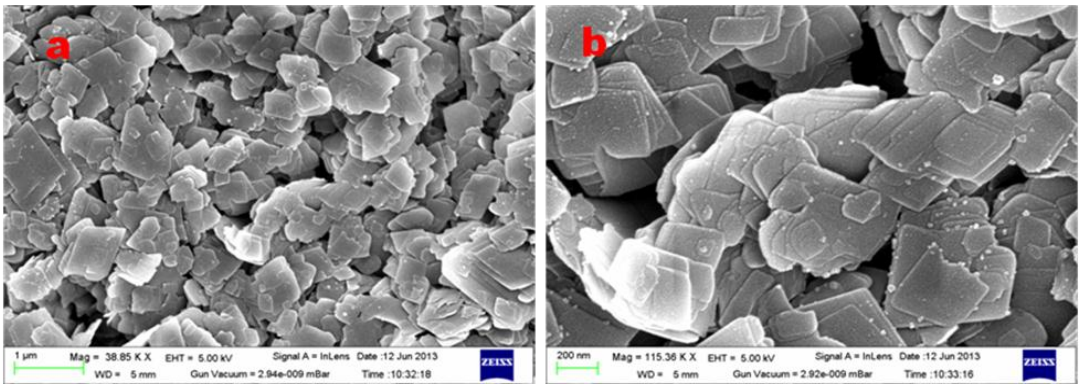

Figure S7: FESEM images of $Cu_3V_2O_8$ at (a) low magnification, (b) medium magnification.

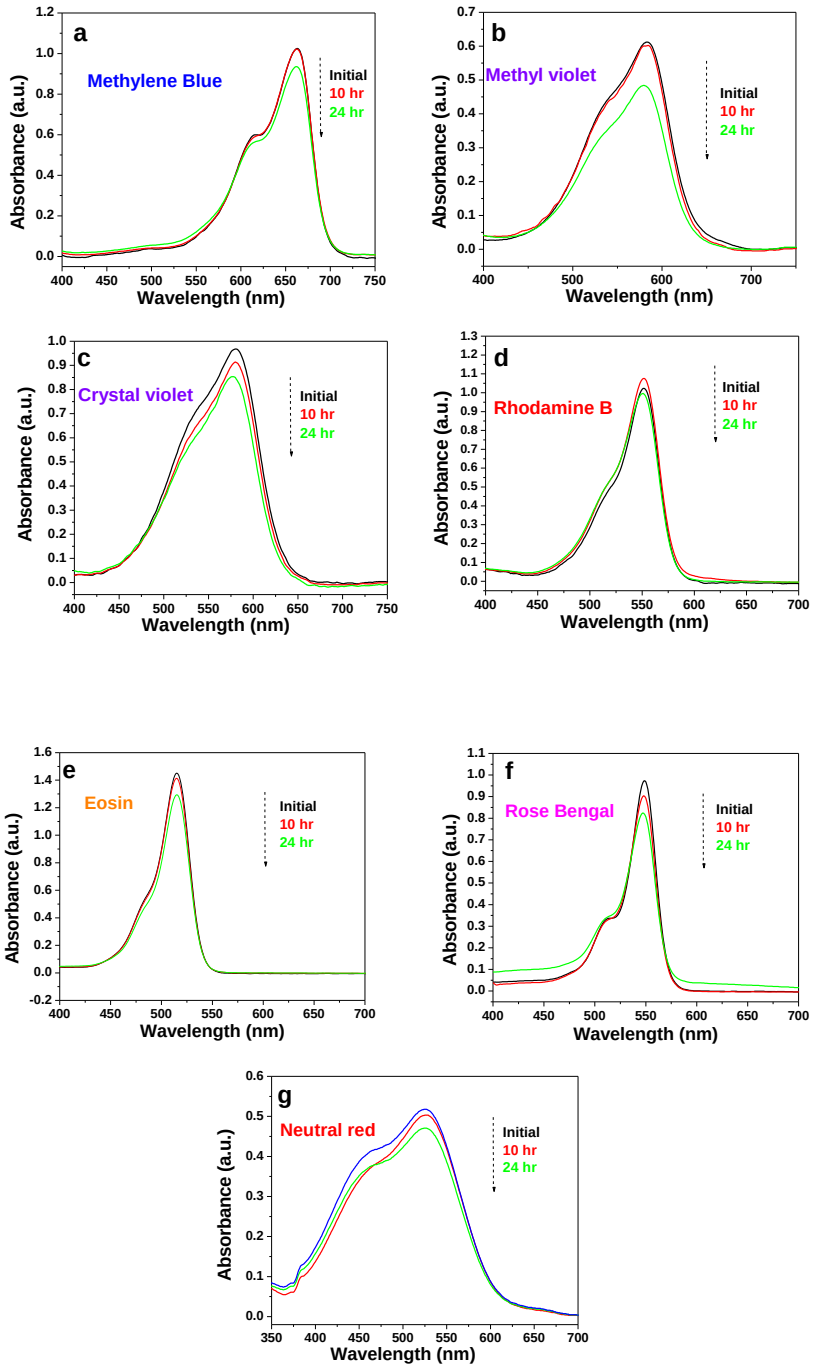

Figure S8: Blank test carried out for various dye molecules in absence of catalyst under UV light (a) methylene blue, (b) methyl violet, (c) crystal violet, (d) Rhodamine B, (e) Eosin, (f) Rose Bengal, (g) Neutral red.

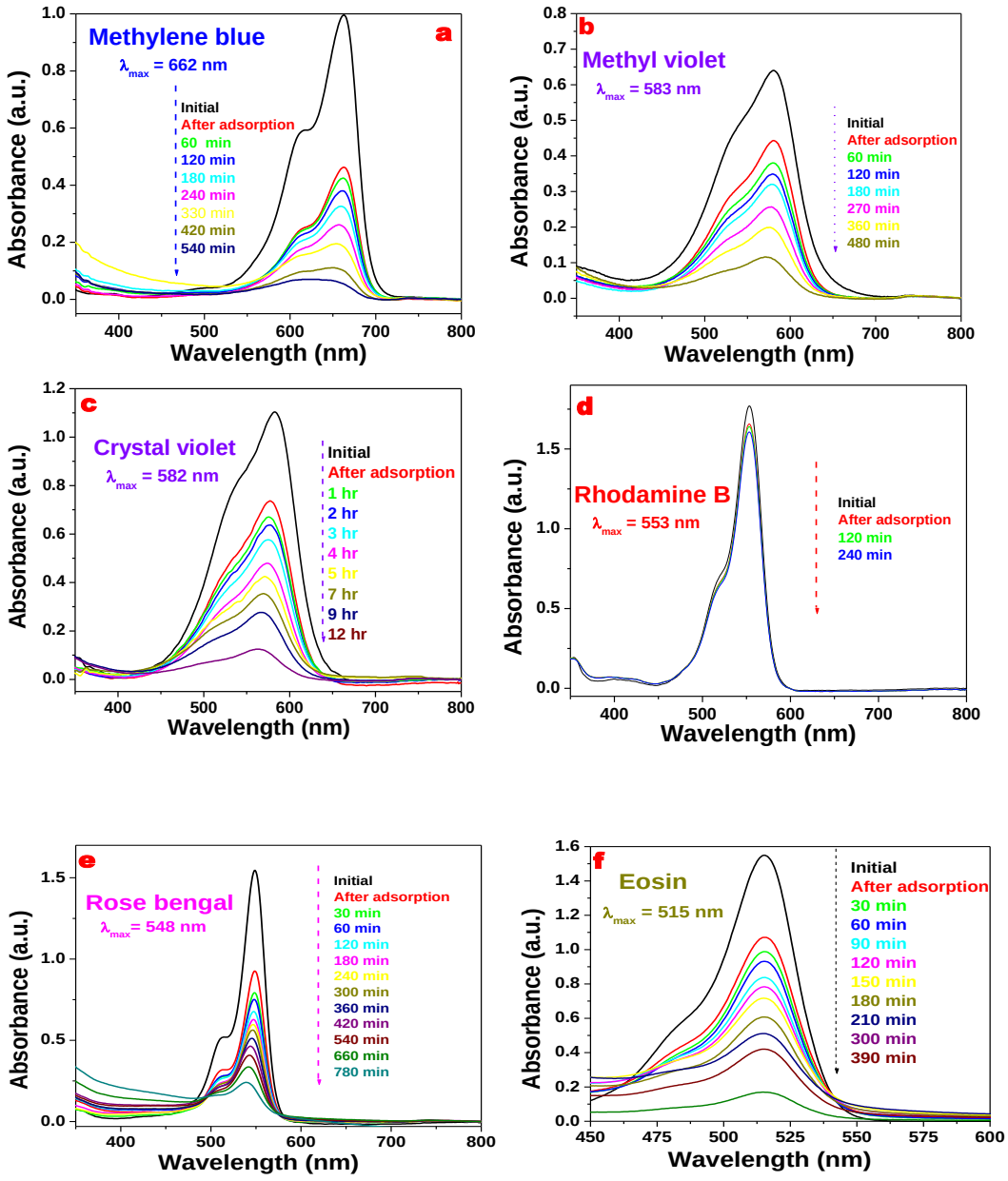

Figure S9: Photodegradation of 50 ml 2 x 10^{-5} M aqueous solution of (a) Methylene blue (b) Methyl violet (c) Crystal violet (d) Rhodamine B (e) Rose Bengal (f) Eosin. In all cases 0.05 gm of $Zn_3V_2O_7(OH)_2(H_2O)_2$ photocatalyst was used (a, b, c, d are cationic dye and e, f are anionic dye).

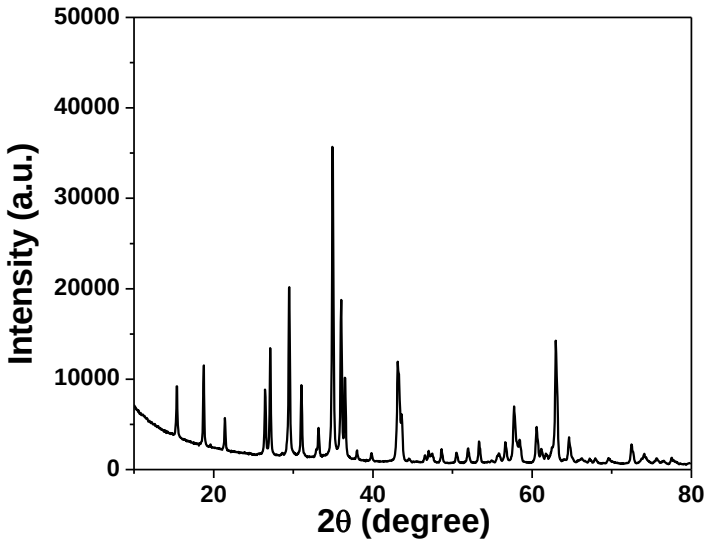

Figure S10: XRD pattern of $Zn_3V_2O_8$ after photocatalysis.