

## Supporting Information

### **Fractal to Monolayer Growth of AgCl and Ag/AgCl Nanoparticle on Vanadium Oxides (VOx) for Visible Light Photocatalysis**

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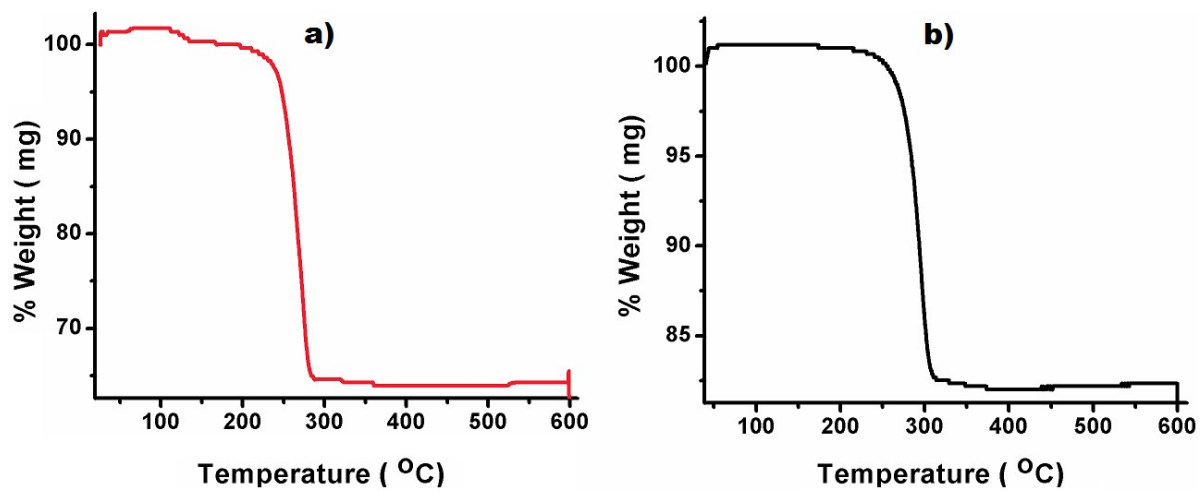
**Materials.** Silver nitrate (AgNO<sub>3</sub>) brought from SRL was used as a source of silver, anhydrous VCl<sub>3</sub> from Sigma-Aldrich was used for vanadium. *cis* and *trans* 1, 2 cyclohexanedicarboxylic acids was brought from Sigma-Aldrich. DMF, triethyl amines were purchased from Merck.

**Physical Measurements.** The infrared spectra (FTIR and FIR) were recorded in a Frontier-MIR-FIR from Perkin-Elmer having mid IR range of 450-4000 cm<sup>-1</sup>. The electronic absorption spectrum was recorded using a Hitachi U-3400 spectrophotometer. This device consisted of a diffuse reflectance attachment equipped with an integrating sphere of 60 mm inner diameter. In order to minimize the effect of fluorescence, mono-chromatic light was used in the whole spectral region. For recording the spectra of catalysts, the well grinded powder sample was placed in a black absorbing hole of a sample holder with the help of a double sided tape and the surface is smoothed with a glass cylinder. The black absorbing hole has a diameter of 10 mm and its deep was 3mm. The layer of the samples can be regarded as infinitely thick, as required by the Kubelka-Munk theory. The spectrum was then recorded in the reflectance mode. On the obtained reflectance data, a Kubelka-Munk (KM) analysis was done. The KM factor, F(R), is given by  $F(R) = (1-R)^2 / 2R = k/s$ , where R is the diffuse reflectance of the samples as compared to BaSO<sub>4</sub>, k is the molar absorption co-efficient and s is the scattering coefficient of the sample. PXRD measurements were made in Philips PANalytical Empyrean instrument and low angle measurement from 2-80° with a minimum step size (2°) of 0.0001. (TEM) and energy dispersive X-ray (EDX) analyses investigations

were carried on a JEM-2010 (JEOL) instrument equipped with a slow-scan CCD camera and at an accelerating voltage of 200kV. The XPS measurements were made on a KRATOS (ESCA AXIS 165) spectrometer by using Mg K $\alpha$  (1253.6 eV) radiation as the excitation source. The finely ground oven-dried samples are dusted on a double stick graphite sheet and mounted on the standard sample holder. The sample holder is then transferred to the analysis chamber, which can house 10 samples at a time, through a rod attached to it. The samples are out gassed in a vacuum oven overnight before XPS measurements. The cyclic voltammogram of catalysts was recorded using CHI-600E meter from CH Instruments, and 0.1 M TBAB (tetra-butyl ammonium bromide) was used as the supporting electrolyte. The working electrode was prepared by taking a 1:1 weight ratio of catalysts in 1 ml of DMF. This suspension was ultrasonicated for 15 min. 10 $\mu$ L of this dispersion was coated on glassy carbon electrode and 5  $\mu$ L of 5% styrene (as binder from Aldrich) was added on these coating and dried. The glassy carbon electrode was then used as the working electrode and SCE was used as reference electrode. Thermogravimetric and differential thermal analysis were performed on simultaneous TG-DTA thermo analyzer, Mettler Toledo, with a Pt crucible, Pt/Pt-Rh 13% thermocouples and flow rate of the controlling (air) of 20 mL/min. Total organic carbon (TOC) was analyzed with a total organic carbon analyzer (Analytik Jena multi-N/C 3100).

**Table S1** Characteristic peaks of FTIR for Compound A, B and C.

| <b>Compound</b> | $\nu(\text{V}=\text{O})$ | $\nu(\text{V}-\text{O}-\text{V})$ | $\nu(\text{V}-\text{O})$ | $\nu(\text{VO}_2)$ | $\nu_{\text{as}}(\text{COO}^-)$ | $\nu_{\text{s}}(\text{COO}^-)$ | $\Delta(\nu_{\text{as}}-\nu_{\text{s}})$ |
|-----------------|--------------------------|-----------------------------------|--------------------------|--------------------|---------------------------------|--------------------------------|--|
| A               | 919                      | 837                               | 635                      | 517                | -                               | -                              | -  |
| B               | 932                      | 894                               | 676                      | 556                | 1552                            | 1405                           | 147                                      |
| C               | 932                      | 893                               | 675                      | 549                | 1556                            | 1427                           | 128                                      |



**Fig. S1** TGA plots of Compound B and Compound C

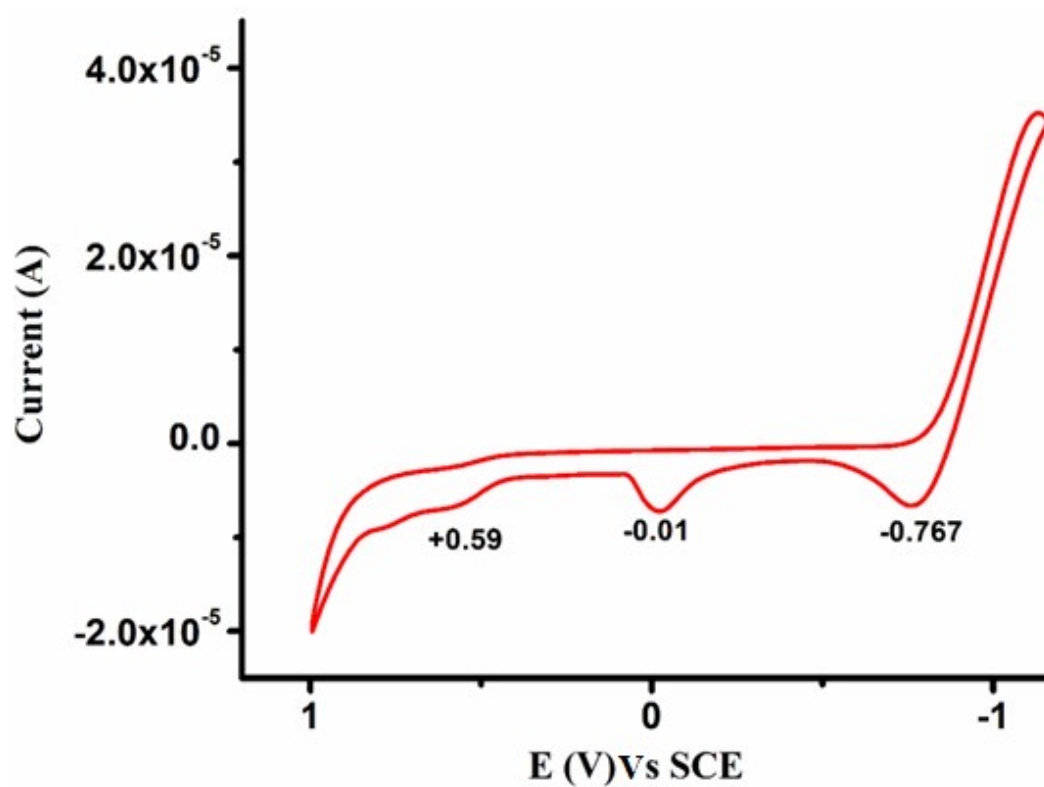
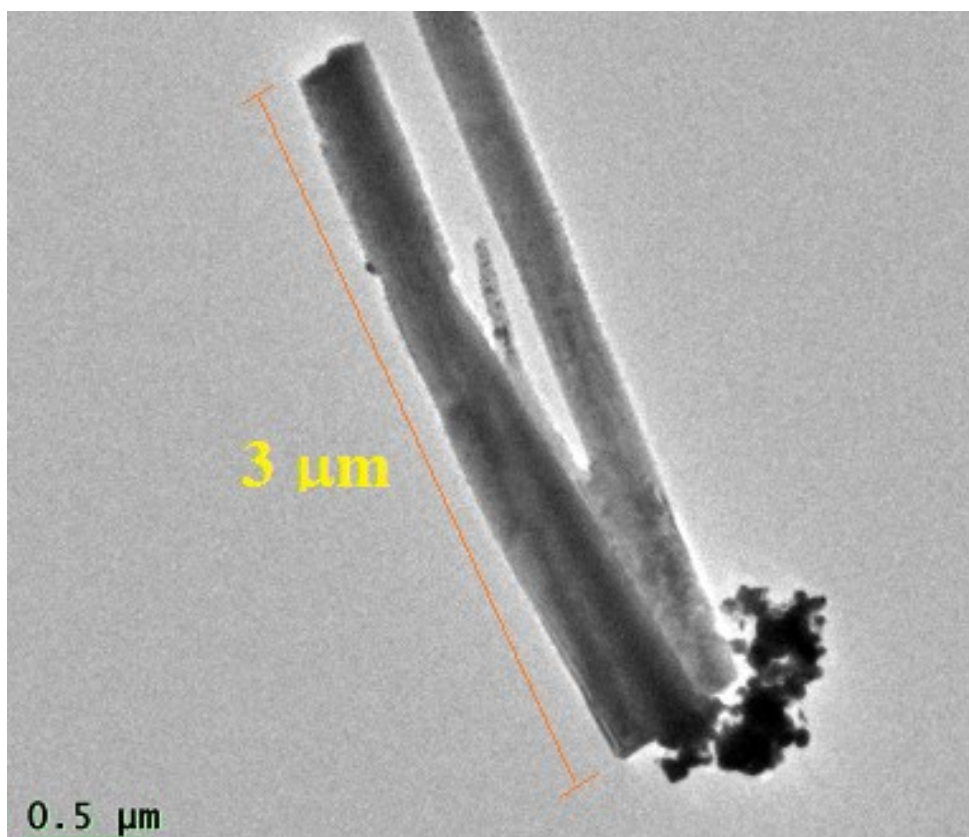
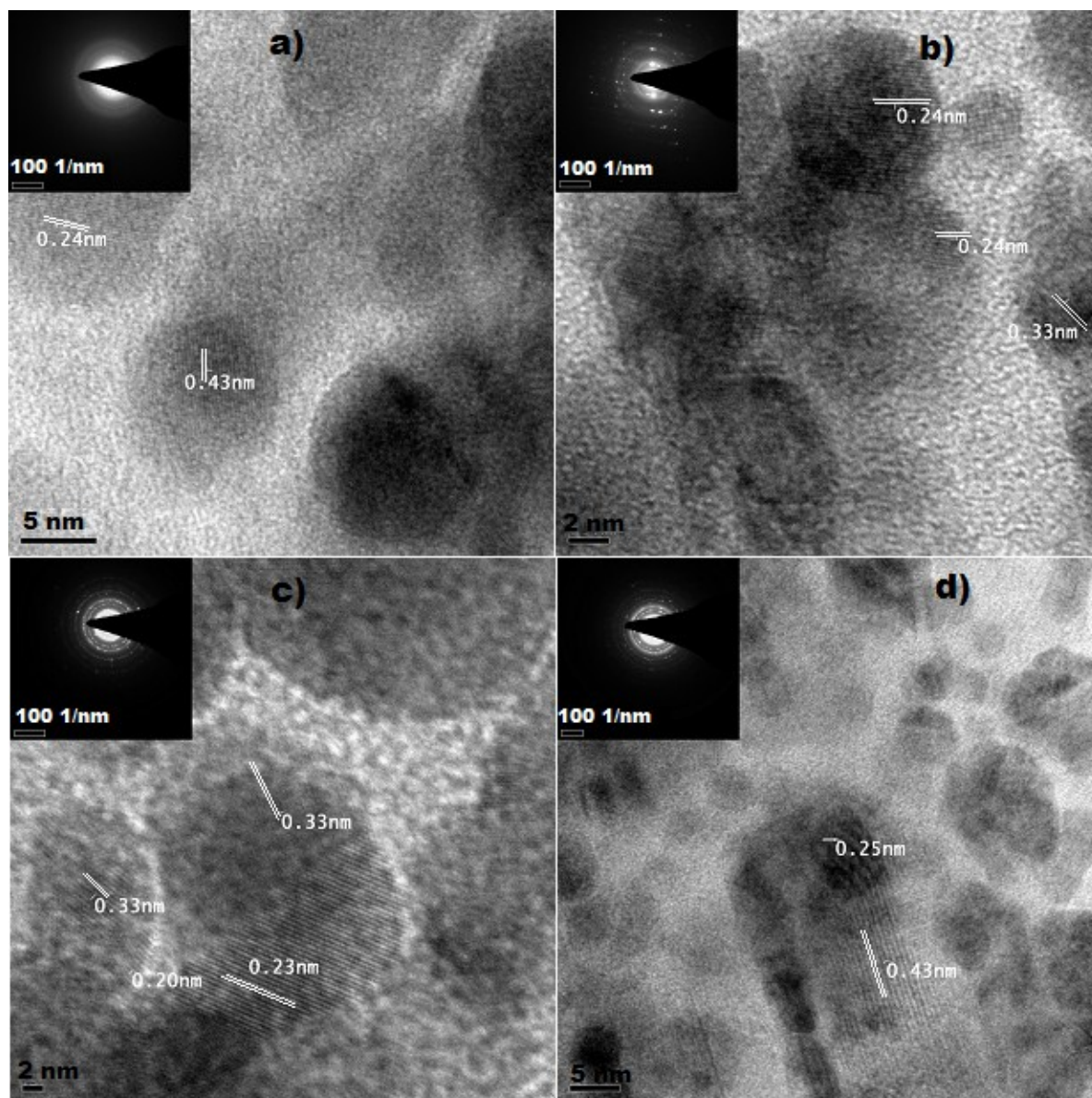


Fig. S2 CV of Compound C



**Fig. S3** Nanorod structure of Compound D of length 3-4  $\mu\text{m}$



**Fig. S4** HR TEM images and SAED pattern of compound a) A, b) B, c) C and d) D.

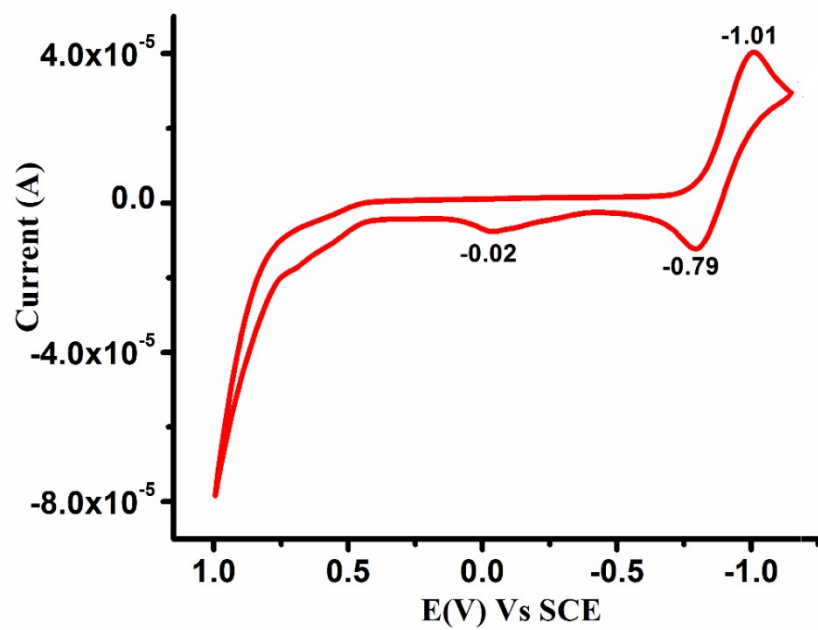


Fig. S5 CV of Compound D

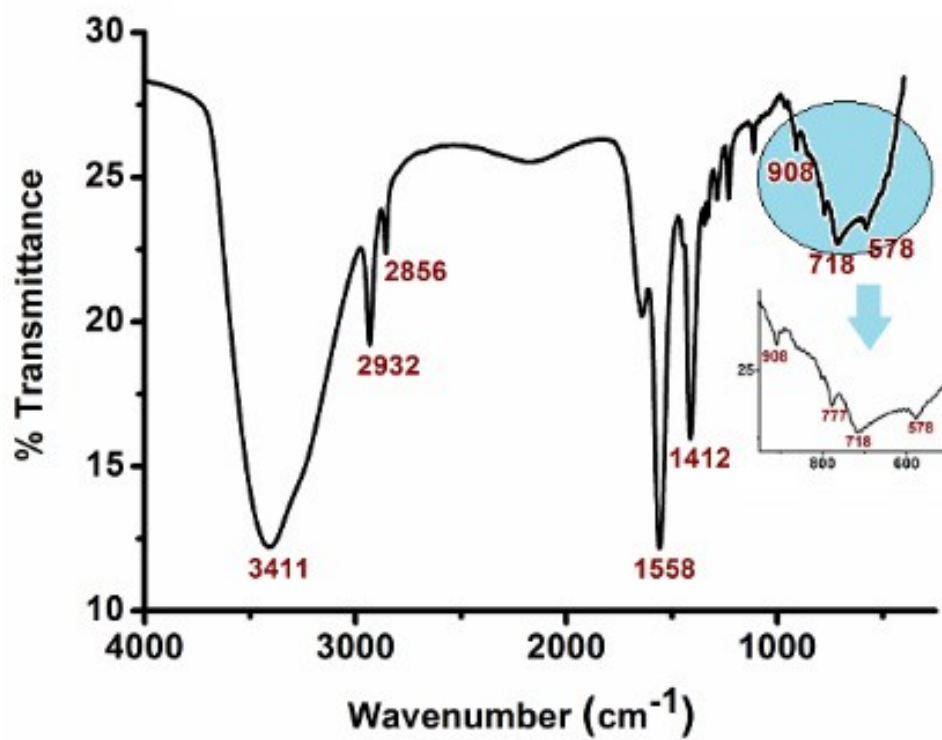


Fig. S6 FTIR of Compound D



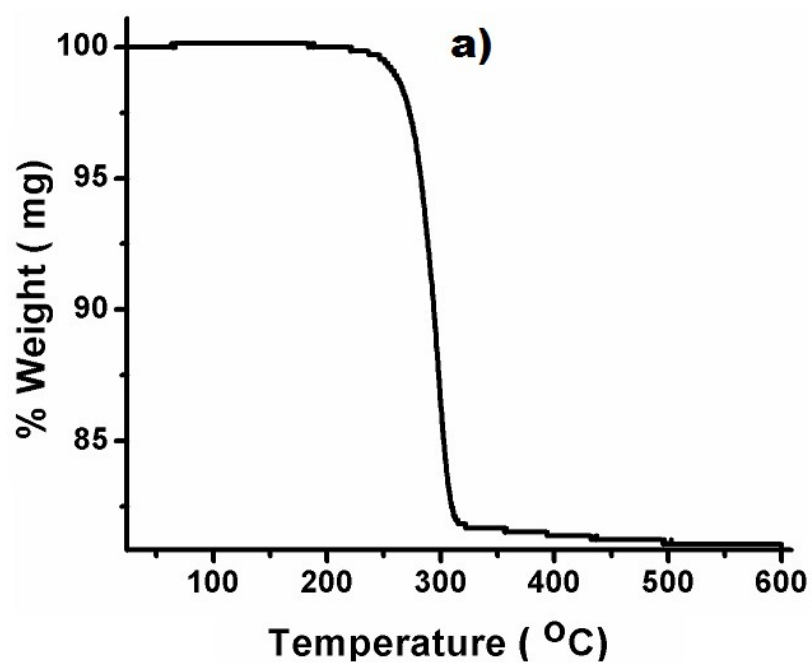
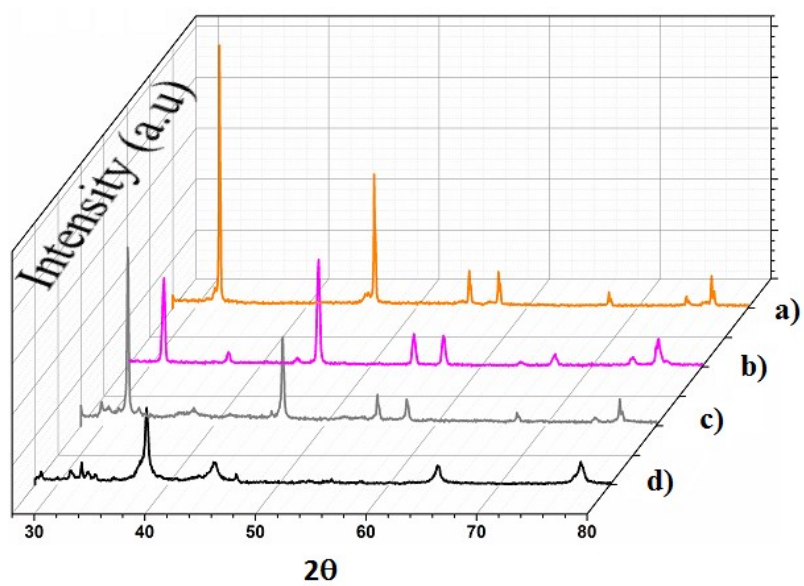


Fig. S7 TGA plot of compound D



**Fig S8.** PXRD of the recycled catalyst for a) Compound A, b) Compound B, Compound C and d) Compound D.