

Electronic Supplementary Information

Pyridine intercalated facile synthesis of ultra-long V₂O₅ nanowire from commercial V₂O₅: Catalytic application in selective dye degradation

Anindita Roy, Mukul Pradhan, Chaiti Ray, Ramkrishna Sahoo, Soumen
Dutta, Tarasankar Pal*

Department of Chemistry, Indian Institute of Technology, Kharagpur-721302, India

E-mail: tpal@chem.iitkgp.ernet.in

S1. Reagents Used:

All reagents used for the synthesis process were of AR grade and applied without any further purification. Distilled water was employed for carrying out the whole experiment. We use commercial V_2O_5 from Merck, HNO_3 acid from Merck 69% GR, SRL extrapure pyridine for synthesis ultra-long V_2O_5 NW. For washing purpose, ethanol from Changshu Yangyuan chemical china and acetone are used.

Dyes used for analytical purpose are methylene blue (MB), methyl green (MG), rhodamine B (Rh B), crystal violet (CV) is supplied from LOBA Chemie. Malachite green (Mal. G) is supplied by Merck.

S2. Instrumentation:

Powder X-Ray diffraction (XRD) was recorded with a Philips PW-1710 X-ray diffractometer (40kV, 20 mA) using Cu $K\alpha$ radiation ($\lambda = 1.5418 \text{ \AA}$) in the range of 5° - 90° at a scanning rate of $0.5^\circ \text{ min}^{-1}$. For analysing the XRD data, JCPDS software guided us.

Fourier transform infrared (FTIR) spectral studies were done in KBr pellets in reflectance mode with Thermo- Nicolet continuum FTIR microscope.

Surface morphology was analysed using field emission scanning electron microscopy (FESEM) with a supra, Carl Zeiss Pvt. Ltd. Elemental detection of material was done with an energy dispersive X-ray microanalyser (OXFORD ISI 3000 EDAX) attached to the scanning electron microscopy.

For gaining further information in structural analysis, transmission electron microscopy (TEM) analysis was done with the help of Hitachi H-9000 NAR transmission electron microscope, using accelerating voltage at 200 kV.

X-ray photoelectron spectroscopy (XPS) analysis was performed to determine the different chemical states of the elements on the surface with the help of VG Scientific ESCALAB MK II spectrometer (UK) equipped with Mg $K\alpha$ excitation source (1253.6 eV) and a five-channeltron detection system.

UV-visible spectral analyses were done using SPECTRASCAN UV 2600 digital spectrophotometer (Chemito, INDIA).

Diffusion reflectance spectroscopy (DRS) analysis was done using Cary model 5000 UV-vis NIR spectrophotometer.

Ion chromatography (IC) analysis was done using model 803 basic IC plus 1 supplied by M/s, Metrohm, Florida, USA.

Tab. S1: Concentration of sulfate ion (SO_4^{2-}) present in the solution of 20 ml (5×10^{-5}) M MB after degradation by V-1 at catalyst dose of 0.25 g/L.

Peak number	Retention time min	Area ($\mu\text{S/cm}$) x min	Height $\mu\text{S/cm}$	Concentration ppm	Component name
1	15.698	0.3623	0.756	5.073	Sulfate (SO_4^{2-})

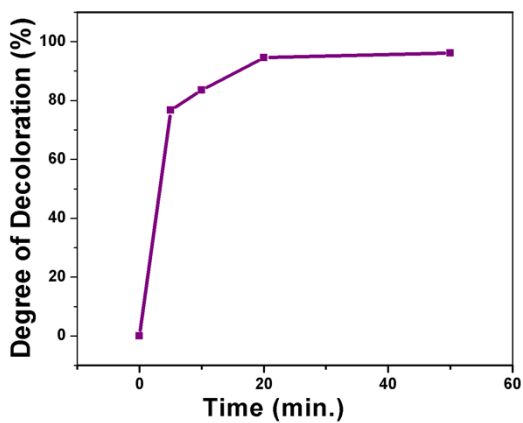


Fig. S1: Degree of decolouration of MB in dark condition.

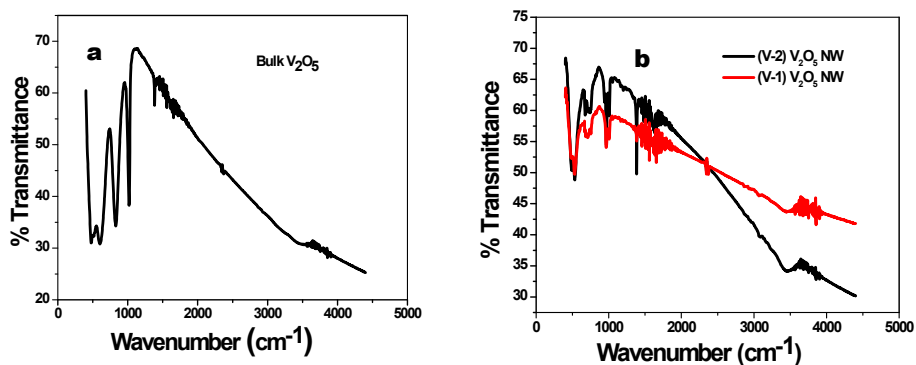


Fig. S2: FTIR spectra of (a) bulk V_2O_5 used as precursor. (b) Represents comparison of FTIR between as-synthesised V-1 and V-2 type of NW.

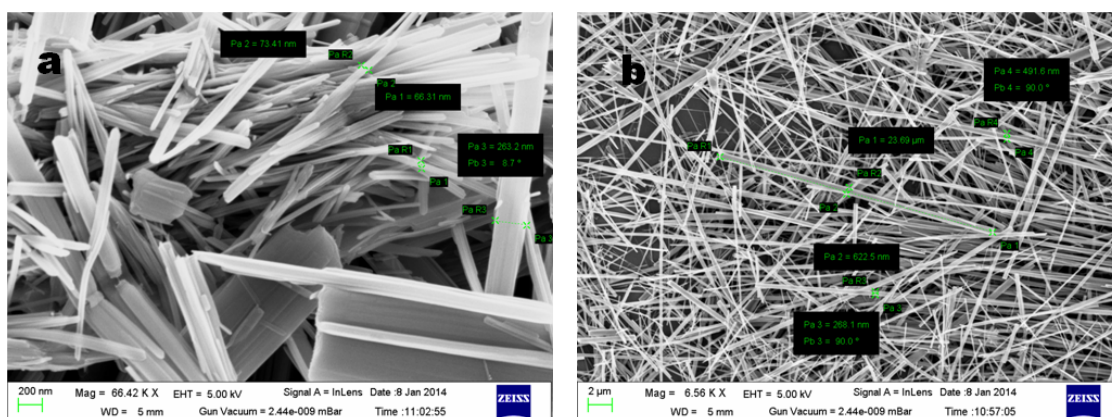


Fig. S3: Determination of size parameter for (a) V_2O_5 NW (V-1) prepared from pyridine- HNO_3 system and (b) V_2O_5 NW (V-2) prepared from pyridine derived synthesis.

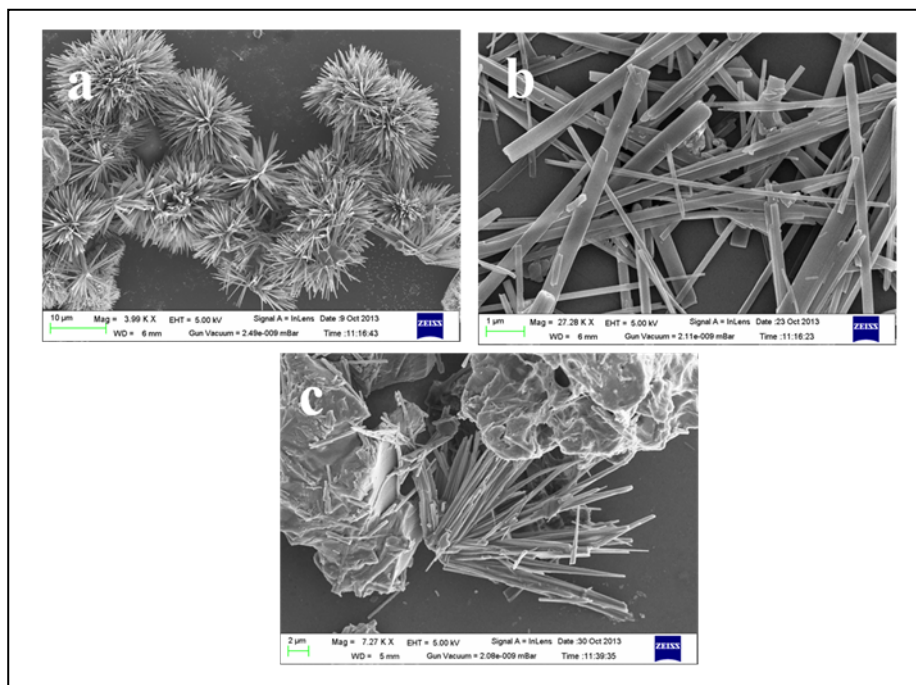
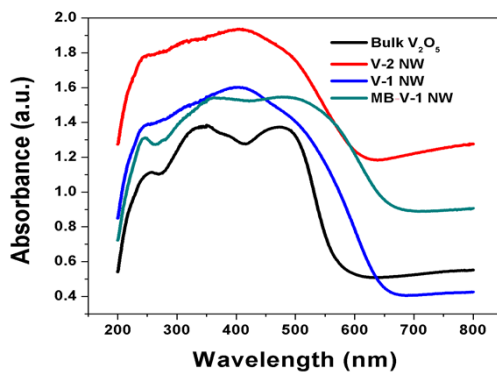
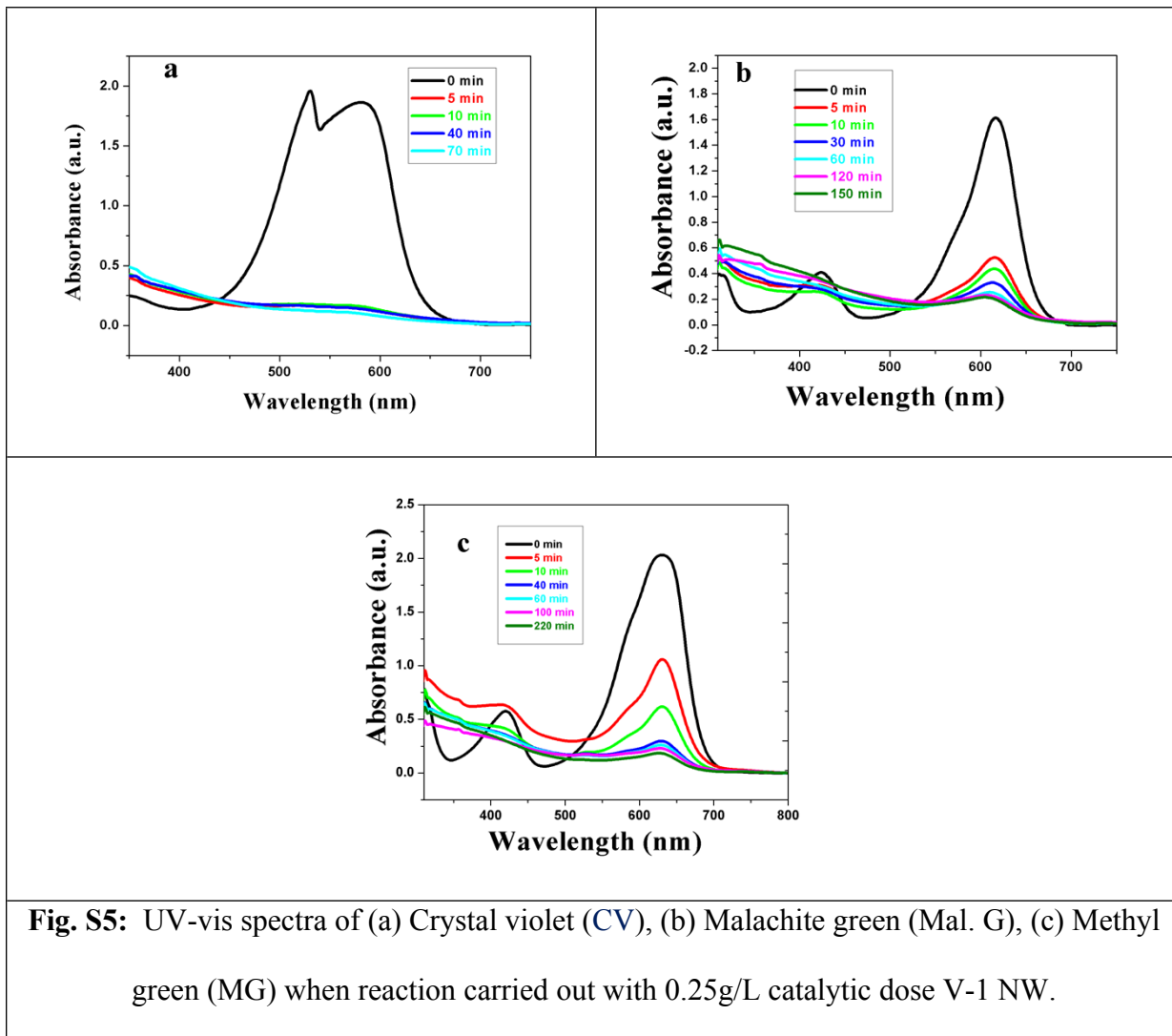


Fig. S4: FESEM images of V₂O₅ nanostructure using (a) PVP (neutral), (b) SDS (anionic) and (c) CTAB (cationic) surfactants.



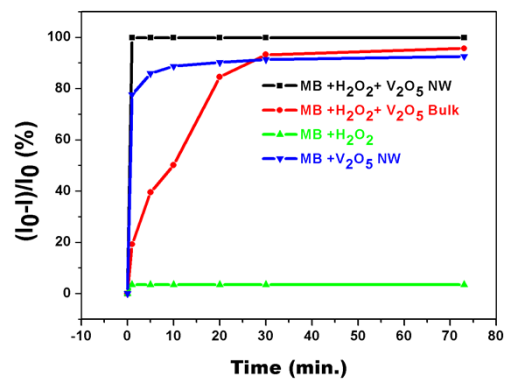


Fig. S7: Comparison of degree of decolouration of MB amongst different sets e.g. H₂O₂ + V₂O₅ bulk, H₂O₂ + V₂O₅ NW, only H₂O₂ and only V-1 NW.