Supporting Information

Silver Molybdates with Intriguing Morphology and Peroxidase Mimic with High Sulfide Sensing Capacity

Teresa Aditya,[a] Jayasmita Jana,[a] Ramkrishna Sahoo,[a] Anindita Roy,[a] Anjali Pal[b] and Tarasankar Pal.*[a]

[a]Department of Chemistry, Indian Institute of Technology, Kharagpur-721302, India

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

[b]Department of Civil Engineering, Indian Institute of Technology, Kharagpur-721302, India

Chemicals. Double distilled water was used throughout all the experiments. Silver nitrate ($AgNO_3$), ammonium heptamolybdate [$(NH_4)_6Mo_7O_{24}$], sodium dihydrogen phosphate (NaH_2PO_4), 3,3′,5,5′-tetramethylbenzidine (TMB), hydrogen peroxide (H_2O_2) salts of sodium and other chemicals were purchased from E-Merck and nitric acid (HNO3) were purchased from Sigma-Aldrich. All the glass wares were cleaned with aqua regia and double distilled water, and dried prior to use.

Syntheses of ammonium phosphomolybdate (APM). In a typical syntheses 20 ml 0.05 M NaH_2PO_4 was taken and to it an excess about 40 ml 0.05 M $(NH_4)_6Mo_7O_{24}$ was added and kept in a water bath. About 10 ml dilute HNO_3 was added to the warm mixture, when a yellow precipitate began to settle down. The precipitate was then washed repeatedly with copious amount distilled water till it was acid free and then vacuum dried for further use.

Analytical instruments. Powder X-Ray diffraction (XRD) was investigated with a Philips PW-1710 X-ray diffractometer (40kV, 20 mA) using Cu Kα radiation ((λ = 1.5418 Å) in the range of 5°-90° at a scanning rate of 0.5° min^{-1}. For analysing the XRD data, JCPDS software was referred. Surface chemical analysis was analysed by X-Ray photoelectron spectroscopy

(XPS) (SPECS PHOIBOS 100 MCD energy analyser), in an ultra-high vacuum environment (1.9×10^{-9} mbar) using Al Kα anode (1486.6 eV). Pass energy of 40 eV for survey scan and 30 eV for high resolution scan have been used during acquisition of the XPS spectra. High-resolution scans were recorded for comprehending the chemical environment of the constituent elements present at the surface. Each scan was repeated 3 times in order to reduce the signal to noise ratio.Surface morphology was examined using field emission scanning electron microscopy (FESEM) with a supra, Carl Zeiss Pvt. Ltd. Elemental detection of the nanomaterials was done with an energy dispersive X-ray (EDX) microanalyser (OXFORD ISI 3000 EDAX) attached to the scanning electron microscopy. For acquisition of further information on structural aspect, transmission electron microscopy (TEM), high resolution transmission electron microscopy (HRTEM) and selected area electron diffraction (SAED) analysis was done with the help of Hitachi H-9000 NAR 2 transmission electron microscope, using accelerating voltage at 200 kV. The UV-visible absorption spectrum of the dye solution was recorded using a Shimadzu UV-1601 UV−vis spectrophotometer. The gas sorption experiment was carried out using a Quantacrome autosorb iQ automated gas sorption analyzer. Thermo gravimetric analysis (TGA) of all the dry powder samples were carried out at a heating rate of 10°C min^{-1} between room temperature and 500°C under air atmospheres on a Pyris TGA linked to a Pyris diamond TA lab system (Perkin–Elmer Co., USA).

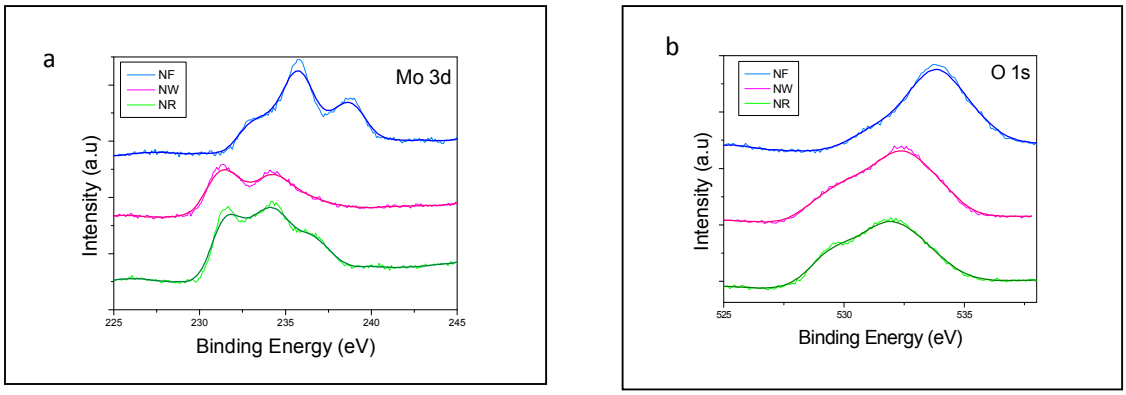
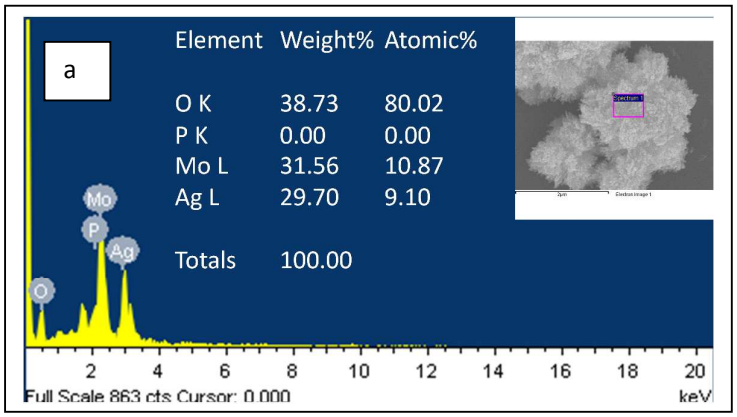
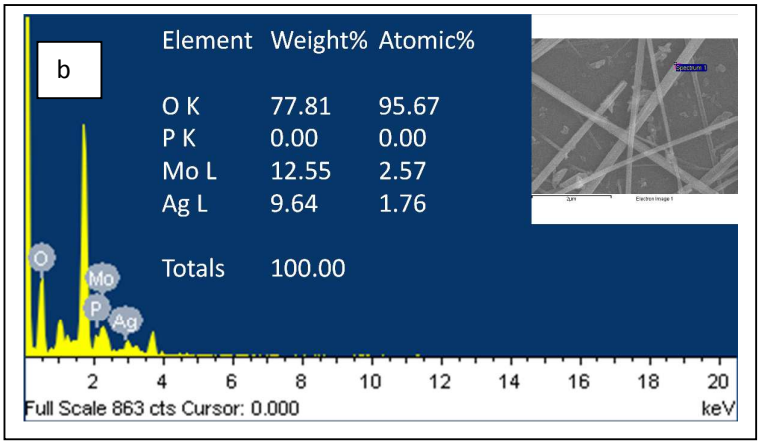


Figure S1. Comparative XPS analysis of (a) Mo 3d, and (b) O1s elements of NF, NW, NR.





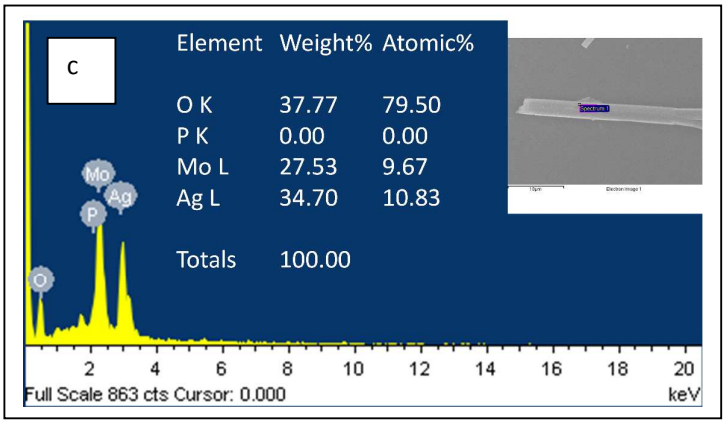


Figure S2. EDX analysis of (a) NF, (b) NW, and (c) NR.

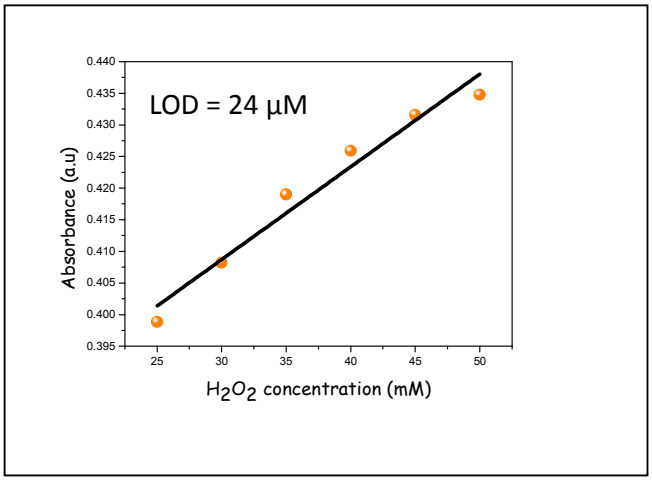


Figure S3. Linear calibration plot of H_2O_2 sensing employing TMB oxidation reaction and silver molybdates as the artificial enzyme.