

Supporting information for

“Facile synthesis of nanoporous anatase spheres and their environmental applications”

Liang-Shu Zhong,^a Jin-Song Hu, Li-Jun Wan,* Wei-Guo Song*

Beijing National Laboratory for Molecular Sciences

Institute of Chemistry, Chinese Academy of Sciences (CAS), Beijing 100080, China

^aAlso in Graduate School of CAS, Beijing, China

Experimental Section

Synthesis of TiO₂ precursor:

The titanium glycolate precursor spheres were synthesized according to the reported procedure with minor modifications.²² In a typical procedure, 2 mL tetrabutoxytitanium (Beijing Chemicals Co.) was added to 50 mL ethylene glycol (Beijing Chemicals Co.) and was magnetically stirred for 8 hours at room temperature, then the mixture was poured into a solution containing 170 mL acetone (Beijing Chemicals Co.) and 2.7 mL water, and was vigorously stirred for an hour. The white precipitate was harvested by centrifugation, followed by washing with ethanol for five times and was dried at 50 °C for further usage.

Synthesis of nanoporous TiO₂:

0.1 g titanium glycolate precursor was added to 20 mL water and was heated to reflux under stirring. After refluxing for an hour, the white precipitate was obtained by centrifugation, followed by washing with water for five times and was dried at 50 °C for further usage.

Characterization:

The products were characterized by scanning electron microscope (SEM, Hitachi S-4300F), transmission electron microscopy (TEM, JEM JEOL 2010), X-ray powder diffraction (XRD, Rigaku D/max-2500 diffractometer with CuK α radiation, $\lambda=0.1542$ nm, 40 kV, 100 mA), BET (Micrometrics ASAP 2020).

As(V) removal experiment:

Solutions containing different concentration of As(V) were prepared using $\text{Na}_3\text{AsO}_4 \cdot 12\text{H}_2\text{O}$ (Beijing Chemicals Co.) as the source of As(V). The pH value was adjusted to 4 by HCl and NaOH. Then 0.01 g TiO_2 sample was added to 5 mL of the above solutions under stirring. After 5 h under stirring at room temperature, solid and liquid were separated. Inductively Coupled Plasma-Optical Emission Spectroscopy (Optima 5300DV) was used to measure the arsenic concentration in the remaining solutions.

Photodegradation of eosin B:

10 mg photocatalyst was added to 15 mL eosin B (Sigma-Aldrich Chemical Co) solution with the concentration of 0.013 g L^{-1} . The reaction system was stirred in the dark for half an hour to reach the adsorption equilibrium of eosin B and then exposed to UV light from a high-pressure Hg lamp (500 W). UV/Vis adsorption spectra (Shimadzu UV-1601PC) were recorded at different intervals to monitor the process.

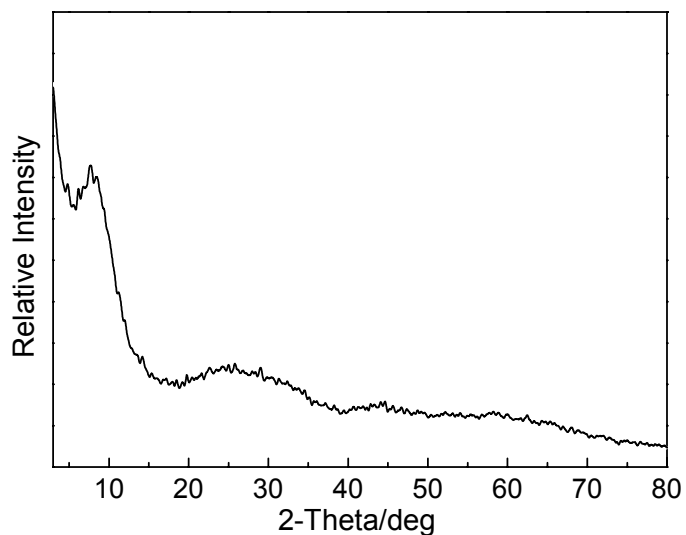


Fig. S1 XRD pattern of the titanium glycolate precursor.

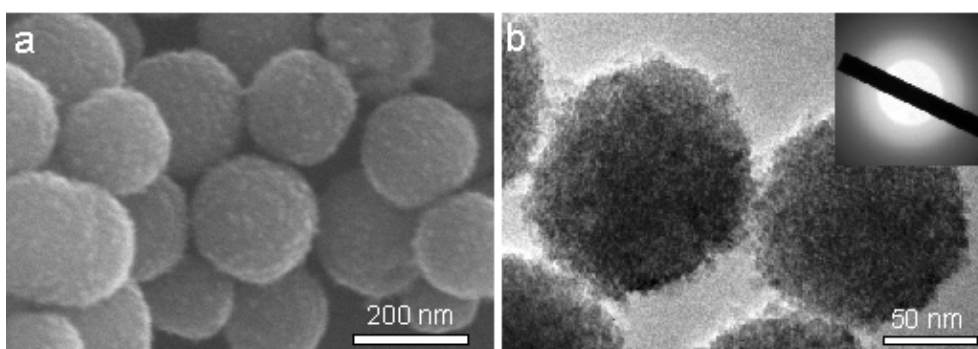


Fig. S2 SEM (a) and TEM (b) images of the intermediate sample obtained after refluxing for 15 min. The inset of Figure b is the SAED pattern.

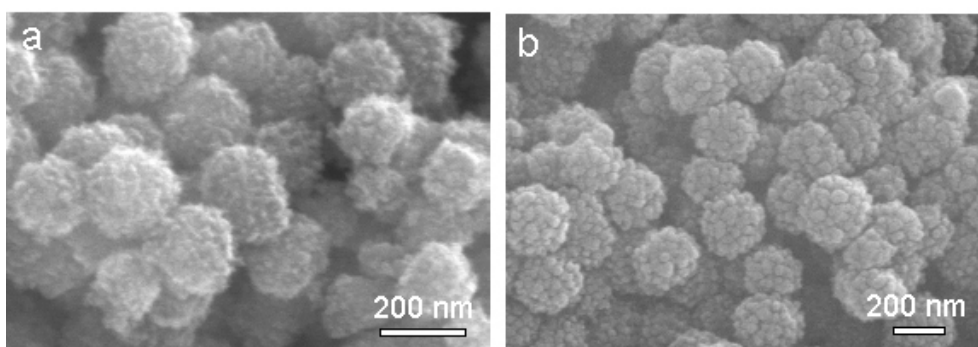


Fig. S3 SEM images of the nanoporous TiO₂ spheres obtained at 50 °C for 23 hours (a) and room temperature (ca. 25 °C) for 15 days (b).

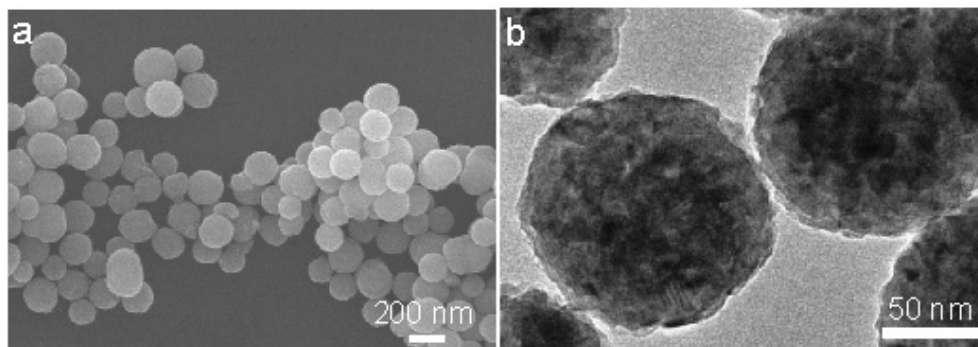


Fig. S4 SEM (a) and TEM (b) images of the TiO_2 obtained by direct calcination of the precursor.