2D Nanosheets Self-Assemblied by Pillar[6]arene and

Polyoxometalate with Enhanced Ability of Dyes Degradation

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Reagents and Materials

All the reagents and solvents were available commercially and used as received without purification. $H_3[PW_{12}O_{40}]$ was purchased from Alfa Aesarand. Rhodamine B (RhB), methyl orange (MO) and H_2O_2 were purchased from Sinopharm Chemical Reagent Co., Ltd.

Methods and Characterizations

UV-Vis absorption spectra were recorded using a UV-Vis spectrometer (light path 10 mm). The temperature was controlled by a TCU accessory with temperature probe which was plunged into the cuvette to measure the sample temperature. High-resolution transmission electron microscope (HR-TEM) images were obtained on a JEOL JEM- 2010FEF high-resolution transmission electron microscope with an accelerating voltage of 200 kV. The samples were prepared by placing a drop of solution onto a carbon coated copper grid and air-dried. Field-emission scanning electron microscopy (FE-SEM) image and element mapping analysis were characterized by a JEOL JSM-7500F at 5.0 kV. All experiments were performed in deionized water under ambient conditions, unless otherwise indicated.

Fabrication of the Hybrid Materials and Catalytic Applications

In a typical experiment, the sample was prepared by mixing 0.5 mM (concentration of imidazolium group) P_6 solution to aqueous solution of POM with charge ratio 1:1 under stirring. After about 0.5 h, the solid hybrid materials for further characterizations were obtained by a simple filtration of the above solutions through a commercial filter with pore size of 200 nm.

The MO and RhB dyes were selected as model pollutants for degradation experiments. In a typical experiment, 100 μ l, 1 mM dye solution was added into the 3 ml solution of hybrid material (0.5 mM of imidazolium group) and standing for 30 min to achieve adsorption-desorption equilibrium. Then, 50 μ l of H₂O₂ was added into the above suspension. At given time intervals, the concentrations of the residual dye were determined by monitoring the absorbance at the maximum adsorption

wavelength with UV-Vis spectrophotometer.



Figure S1 (a) Photographs of the assembly, P₆, POM respectively and (b) zeta-potential of the assembly.



Figure S2 Pore size distribution calculated by NLDFT method from N_2 sorption isotherms for hybrid assembly at 77K.



Figure S3 HR-TEM image of the hybrid nanosheets, the circles denote the POM with a size of 1 nm.



Figure S4 TEM images of the assemblies with charge ration (cation : anion = 1:6, 1:3, 3:1, 6:1).



Figure S5 TEM image of the hybrid nanoparticals constructed by P₁ and POM



Figure S6 FTIR spectra of P₁, POM powder, and POM/P₆ hybrid nanosheets.



Figure S7 Raman spectra of P₁, POM powder, and POM/P₆ hybrid nanosheets.



Figure S8 UV–vis spectra of MO solution in the presence of $P_1/POM/H_2O_2$ with different degrading time.



Figure S9 Proposed catalysis mechanism for the degradation of dyes catalyzed by the hybrid materials in the presence of H_2O_2 .



Figure S10 UV–vis spectra of RhB solution in the presence of $P_6/POM/H_2O_2$ with different degrading time.



Figure S11 $\ln(C_t/C_0)$ as functions of degradation time in the presence of $P_6/POM/H_2O_2$: (a) MO, (b) RhB.