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Supplementary Materials

Immobilization of TiO_2 Nanoparticles in Hydrogels Based on Poly(methyl acrylate) and Succinamide Acid for the Photodegradation of Organic Dyes

Xiaomeng You †, Hailong Huang †, Ran Zhang, Zhongli Yang, Min Xu *, Xue Lu Wang * and Ye-Feng Yao *

Physics Department & Shanghai Key Laboratory of Magnetic Resonance, School of Physics and Electronic Science, East China Normal University, North Zhongshan Road 3663, Shanghai 200062, China; yxmmusian@outlook.com (X.Y.); huanghailong@sinap.ac.cn (H.H.); zhangran@whu.edu.cn (R.Z.); ZhongliYang2021@outlook.com (Z.Y.)

* Correspondence: xumin@phy.ecnu.edu.cn (M.X.); xlwang@phy.ecnu.edu.cn (X.L.W.); yfyao@phy.ecnu.edu.cn (Y.-F.Y.)

† These authors contributed equally.

1. Experimental sections

1.1. Photocatalytic H_2 production test

The photocatalytic H_2 production experiments of the TiO_2, PMA-TiO_2, and SAA-TiO_2 samples were conducted using a photocatalytic system (Labsolar-IIIAG, PerfectLight, Shanghai, China). During the reaction, powder TiO_2 or bulk hydrogel-TiO_2 was immersed in 90 ml deionized water, and 10 ml triethanolamine (TEOA) was added as the sacrificial reagent. The suspension was illuminated under vacuum condition, and the H_2 signal was collected half an hour by a gas chromatography (GC2060, Ruimin). The experiment was carried out under magnetic stirring when powder TiO_2 was used. Considering the hydrogel-TiO_2 is lumpy, the magnetic stirring was not employed. A 300 W xenon lamp (PerfectLight, Beijing, China) was used as the light source. The optical power density was measured as 0.8 W/cm^2, using an optical power meter (PLMW2000, PerfectLight, Shanghai, China).

1.2. Photocatalytic degradation test

The photodegradation performance of TiO_2, PMA-TiO_2, and SAA-TiO_2 samples were evaluated by eliminating methyl orange, methylene blue, rhodamine B, and bright green at a concentration of 20 mg/L. During the test, the bulk hydrogel-TiO_2 was placed in 20 mL organic dye aqueous solution. The mixture was left for 30 min in the dark to obtain absorption-desorption equilibrium. At 15 min intervals, 4 mL of the solution was sampled to measure the absorbance. For comparison, the powder TiO_2 was also used to test the performance when degrading organic dyes. The conditions were the same, but the experiment was carried out under magnetic stirring. Besides, a disposable syringe filter (PTFE, 0.22 μm) was used to remove the solid particle and obtain a clear liquid when sampling. The changes in absorbance of the solution were analyzed on a UV-Vis spectrophotometer (UV-2700, Shimadzu, Shanghai, China) by recording the absorption spectrum in the wavelength range of 200-500 nm. The optical power density was measured as 0.8 W/cm^2, using an optical power meter (PLMW2000, PerfectLight, Beijing, China).

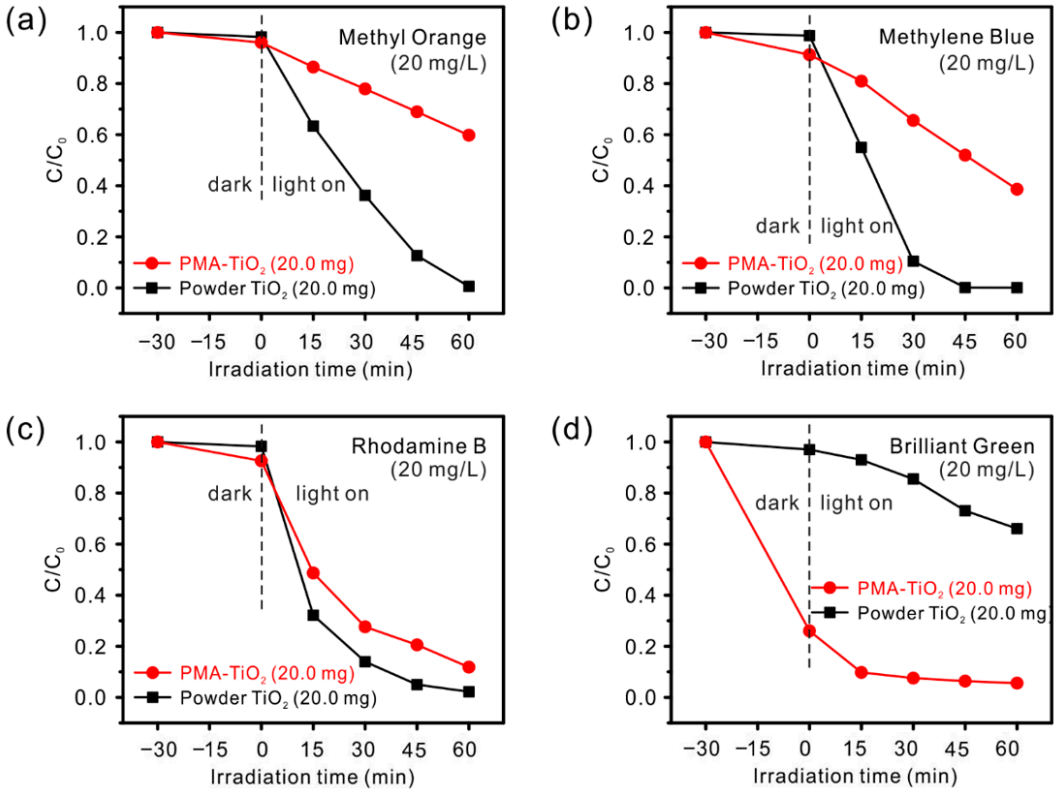

Figure S1. Photodegradation efficiency of (**a**) methyl orange; (**b**) methylene blue; (**c**) Rhodamine B; and (**d**) bright green by powdery TiO_2 and PMA-TiO_2 (20.0 mg) hydrogel, respectively. C_0 represents the initial concentration of the organic dyes, and C represents the real-time concentration.

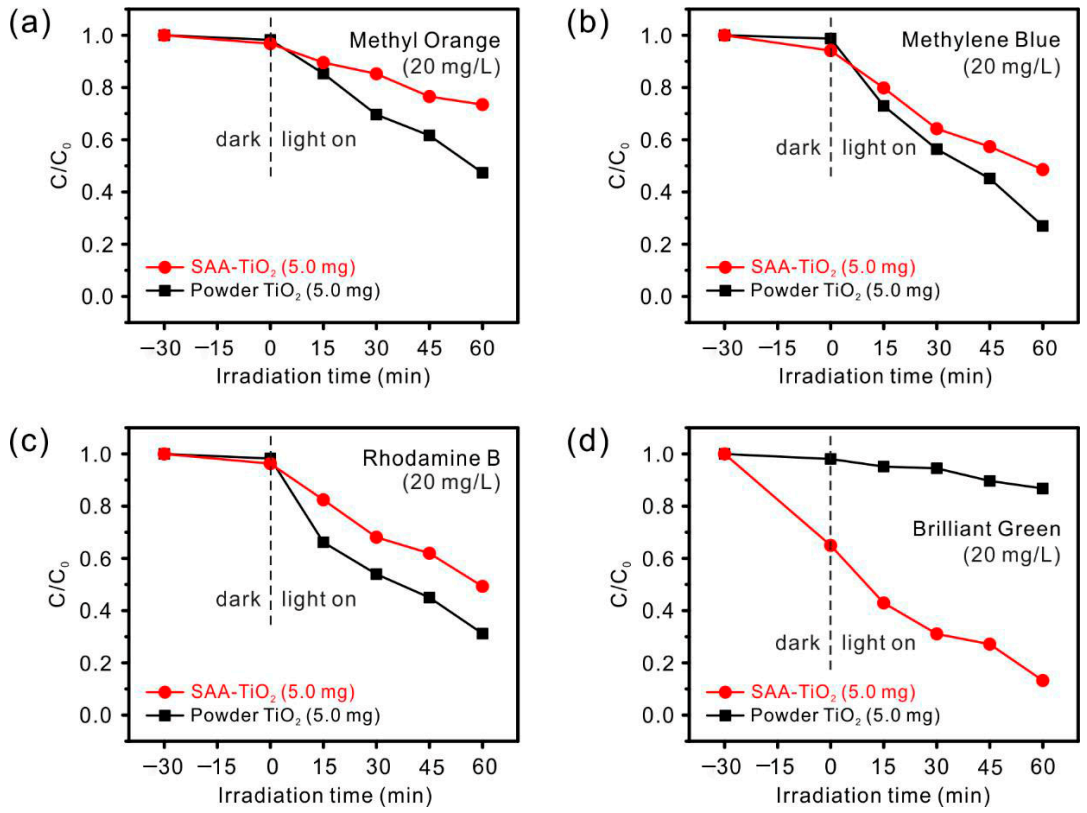

Figure S2. Photodegradation efficiency of (**a**) methyl orange; (**b**) methylene blue; (**c**) Rhodamine B; and (**d**) bright green by powdery TiO_2 and SAA-TiO_2 (5.0 mg) hydrogel, respectively. C_0 represents the initial concentration of the organic dyes, and C represents the real-time concentration.

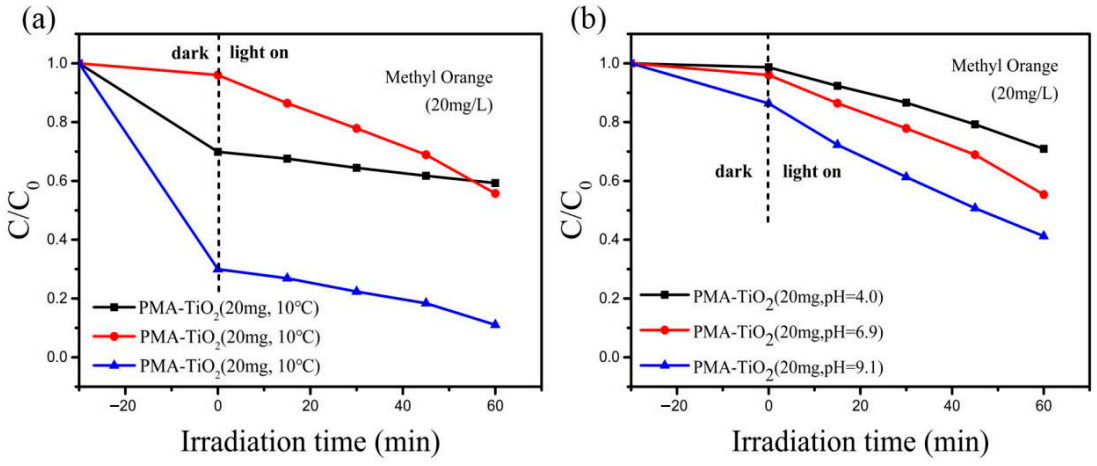

Figure S3. Catalytic performance of PMA-TiO_2 at (**a**) different temperatures and (**b**) different pH.