Supplementary Material (ESI) for Journal of Materials Chemistry

Supplementary information

Facile preparation of anatase /SiO_2 spherical nanocomposites and their application in self-cleaning textiles

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ESI-1: Photocatalytic activities of pure TiO_2 powder and TiO_2/SiO_2 nanocomposite powder

The photocatalytic activities of pure TiO_2 powder and TiO_2/SiO_2 nanocomposite powder were assessed by analyzing the variation in the concentration of the dye solutions containing these powders in 250 ml beakers under UV irradiation (365 nm, Philips TLD 18W/08, the UV intensity was 0.7–0.8 mW cm^{-2}), in which the amount of TiO_2 was maintained at 2g l^{-1} and the initial concentration of Neolan Blue 2G aqueous solution was 0.1 g l^{-1}. The mixture was dispersed ultrasonicly for 15 min and was kept in dark conditions for 0.5 h while shaken to establish the absorption–desorption equilibrium. Then the mixture was exposed to UV irradiation provided by UV lamps (365 nm, Philips TLD 18W/08) while shaken (IKA KS260 Basic Orbital Shaker). After UV irradiation, the dye solution was centrifuged to precipitate powders at the bottom of the tube and the upper clear dye solution was used to record the UV-Vis absorption spectra of irradiated samples on a UV-Vis spectrometer (Perkin Elmer UV-Vis spectrometer Lambda 18). The change in concentration of the dye was estimated by the concentration at the absorption peak for Neolan Blue 2G at 630 nm.

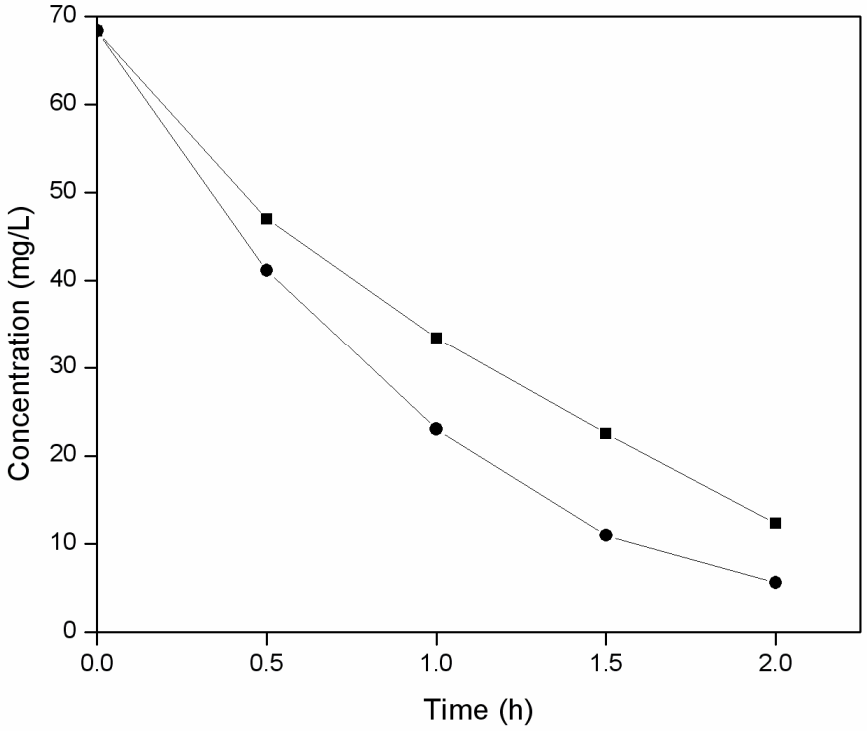

Fig.S1 Variations in concentration of Neolan Blue 2G in an aqueous solution as a function of UV irradiation time for pure TiO_2 powder (■) and TiO_2/SiO_2 nanocomposite powder (●).

ESI-2: Amine titration method for determination of the surface acidity of pure TiO_2 powder and TiO_2/SiO_2 nanocomposite powder

The surface acidity of pure TiO_2 powder and TiO_2/SiO_2 nanocomposite powder was determined by titration with n-butylamine following a procedure as follows. 0.5g photocatalyst powder was dispersed ultrasonicly in 50 ml of benzene. Five drops of a 1.0 g l^{-1} methyl red (pKa = +4.8, $H_0 \leq +4.8$) indicator solution in benzene were added to the flask. N-Butylamine (0.01 mol l^{-1}) was titrated against the powder, and the amount of titrant necessary to cause the color change on the indicator solution was recorded. Although the titration technique has intrinsic limitations, precautions were taken to handle the samples in a consistent manner to ensure that the results were reproducible and could be confidently compared on a relative basis. The titration was repeated three times and the average of which is quoted in this study.

The surface acidity can be evaluated according to the consuming volume of n-butylamine (0.01 mol l^{-1}). The titration results showed that the surface acidity of TiO_2/SiO_2 nanocomposite powder was stronger than that of pure TiO_2 powder.