Supporting information

for

Visible light induced enhanced photocatalytic degradation of organic pollutants in aqueous media using Ag doped hollow TiO_2 nanospheres

Siddhartha Sankar Boxi, Santanu Paria*

Interfaces and Nanomaterials Laboratory, Department of Chemical Engineering, National Institute of Technology, Rourkela 769008, Orissa, India.

The distribution of particle size of AgBr, TiO_2, $AgBr/TiO_2$ and Ag-h-TiO_2 nanoparticles were measured in dynamic light scattering (DLS) instrument. The DLS data in Figure 1 shows that the average particle size was 16.89, 41.52, 20.81 and 20.79 nm for AgBr, TiO_2, $AgBr/TiO_2$ core/shell and Ag-h-TiO_2 nanoparticles, respectively.

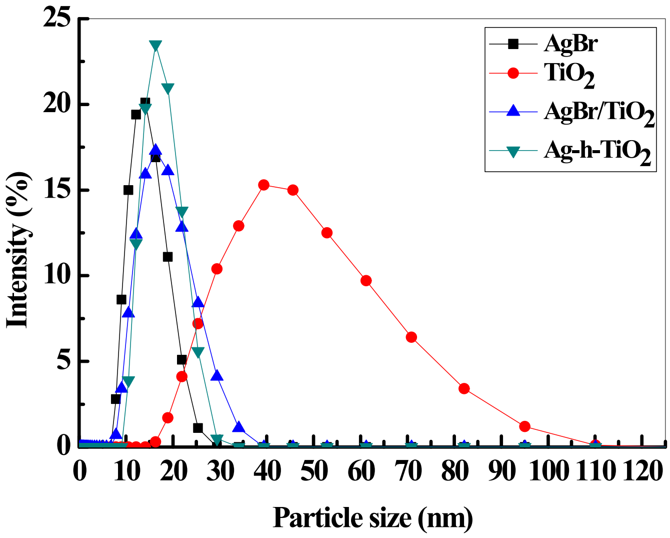

Figure S1. Particle size distribution of AgBr, TiO_2, $AgBr/TiO_2$ and Ag-h-TiO_2 nanoparticles measured by dynamic light scattering (DLS).

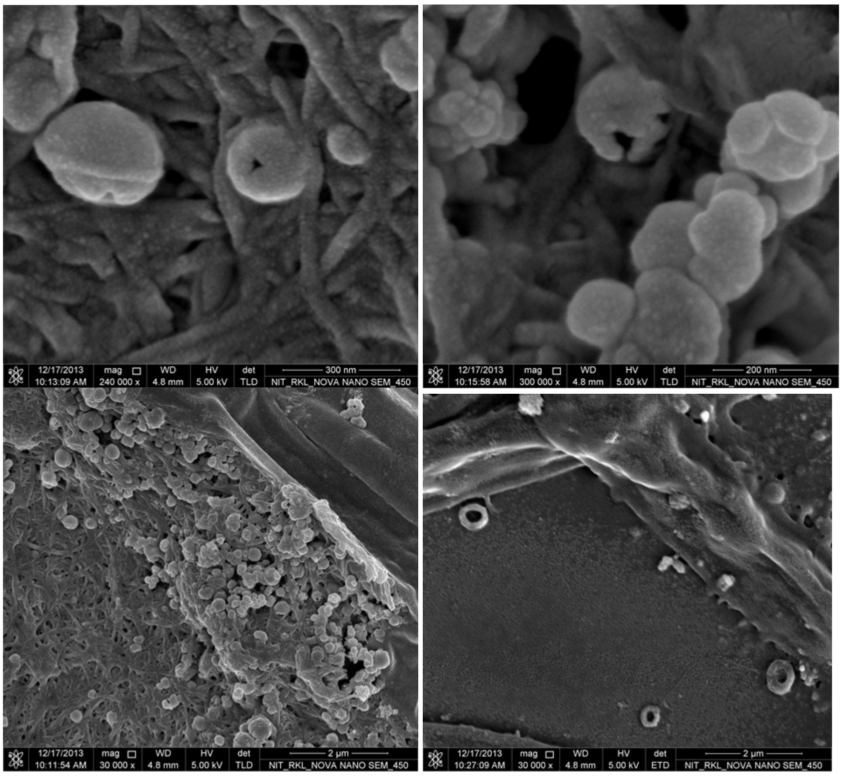

Figure S2: FE-SEM images of Ag-h-TiO_2 nanoparticles with some broken hollow structure.

Quantum yield calculation

Quantum yield was calculated using the equation (1), where phenol was taken as the reference. The refractive index and quantum yield of phenol were taken 1.5425 and 0.14 respectively.

$$Q.Y_S = Q.Y_R \left(\frac{Grad_S}{Grad_R} \right) \times \left(\frac{\eta_S}{\eta_R} \right)^2 \text{--(1)}$$

Where, $Q.Y_S$ – Quantum yield of the sample

$Q.Y_R$ – Quantum yield of the reference (Phenol)

$Grad_S$ – Slope of the Integrate intensity vs. absorbance line for sample

$Grad_R$ – Slope of the Integrate intensity vs. absorbance line for reference (Phenol)

η_S – Refractive index of the sample

η_R – Refractive index of the reference (Phenol)

Table S1. Comparison of the present work of nitrobenzene degradation with the published literature

Catalyst	catalyst dose	Initial NB conc	Light source	Time	parameters	% deg.	Ref.
N-Ce-TiO_2	1 g/L	50 mg/L	visible lamp, 300 W	4 hrs	30°C	53	1
TiO_2	0.2 g/L	50.1 mg/L	14 W UV lamp, 254 nm	3 hrs	air feeding of 150 mL/min	90	2
Nano crystalline TiO_2	0.2 g/L	49.94 mg/L	mercury vapour lamp	8 hrs	air purging	98%	3
Ce-TiO_2	0.1 g/L	25 mg/L	Visible lamp 500 W	7 hrs	pH 9	100	4
Pt/$Cd_2Sb_2O_{6.8}$	2.5 g/L	100.047 mg/L	Xenon lamp	3 hrs	CH_3OH	~100	5
TSA-MIP-TiO_2	0.1 g/L	6.153 mg/L	9 W UV lamp, 253.7 nm	90 min	-	>95	6

Degradation of metronidazole (MTZ) antibiotic has been studied by different technologies such as ultraviolet (UV) irradiation, [7] Oxidation processes using UV, UV/H_2O_2, H_2O_2/Fe^{2+}, and $UV/H_2O_2/Fe^{2+}$, [8] etc. In general these processes are expensive and complicated. [9] Use of Closed Bottle Test (CBT) for MTZ degradation is also not effective because of its low degradation efficiency (25.6%) even after 28 days of incubation time.[10] Apart from these conventional method, use of photocatalyst were also studied as listed in Table S2. It shows lower degradation rate in visible light irradiation, 100% degradation was only achieved in UV-light irradiation and in high catalyst dose. In this approach our synthesized photocatalyst degraded 94.77% MTZ in visible light irradiation, 30 mg/L initial MTZ concentration, 0.5 g/L catalyst dose, and irradiation time of 120min.

Table S2. Comparison of the present work of metronidazole degradation with the published literature

Catalyst	catalyst dose	Initial NB conc	Light source	Time	parameters	% deg.	Ref.
$ZnSnO_3$/RGO nanocomposites	1 g/L	5 mg/L	500 W, visible lamp	180 min		72.5	11
Zn_2GeO_4	1 g/L	10 mg/L	UV light lamp (λ = 253.7 nm)	80 min	-	~100	12
nZVM	0.1 g/L	100 mg/L	-	-	251°C, pH dependent, O_2 flow	84	13

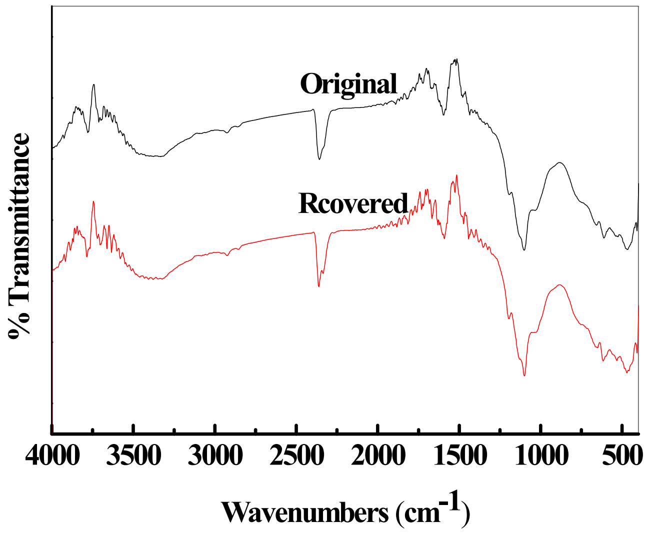

Figure S3. FT-IR spectra of Ag-h-TiO_2 before and after photocatalytic degradation of MTZ solution under visible light.

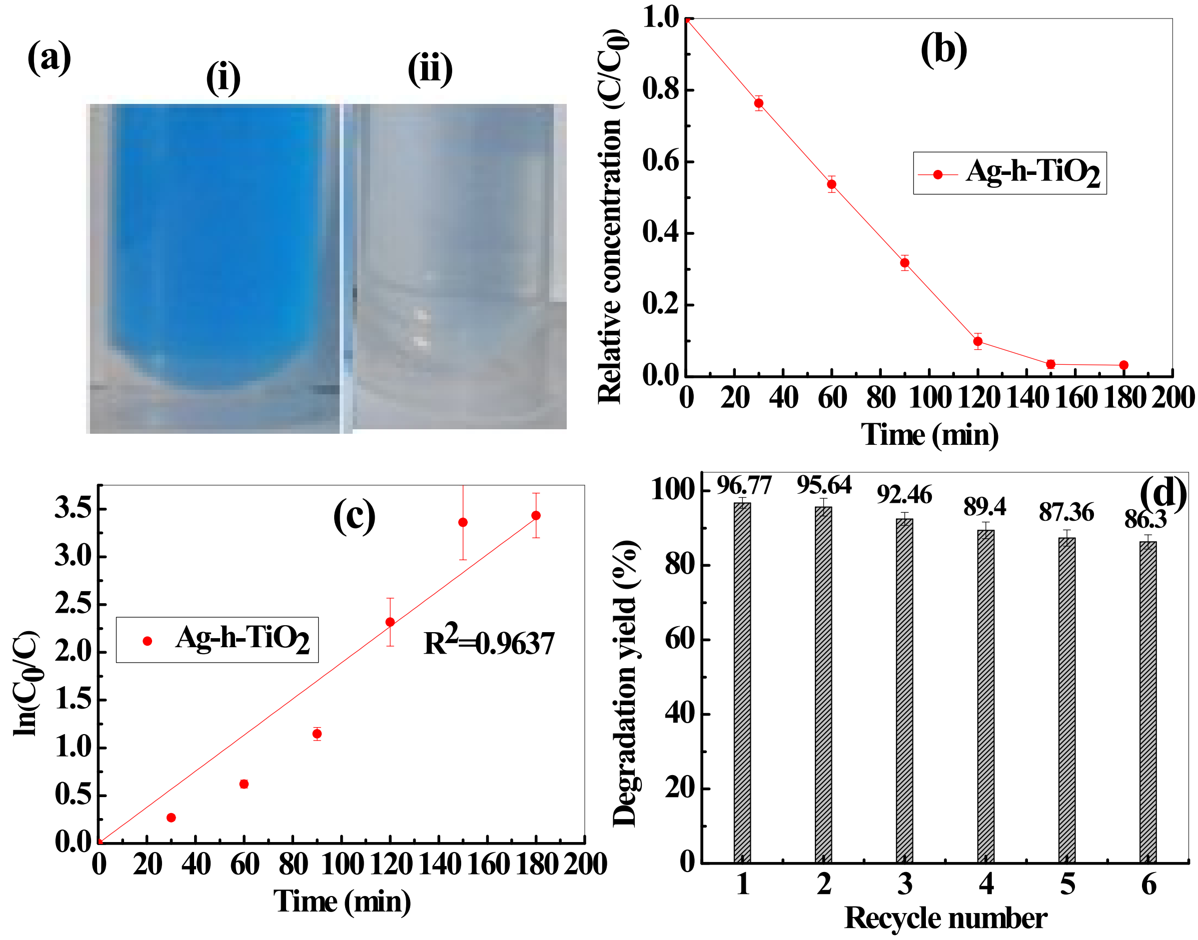

Figure S4. (a) The images of the methylene blue solution before (i) and after degradation under (ii: Ag-h-TiO_2). (b) Photocatalytic degradation and (c) Kinetic data for the degradation of MBD solution in high pressure mercury vapour lamp under Ag-h-TiO_2 NPs. (d) Recycling test of Ag-h-TiO_2 for the degradation of MBD solution under visible light.

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