Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Autocatalytic Synthesis of Multifunctional Precursors for Fabricating Silica Microspheres with Well-Dispersed Ag and Co_3O_4 Nanoparticles

Linxu Xu, Fang Cui [*], *Jiajia Zhang, Yanjun Hao, Yan Wang*[*] *and Tieyu Cui*

School of Chemistry and Chemical Engineering, Harbin Institute of Technology, Harbin 150080, PR China

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Corresponding author. Tel.: (+86)451-86403646

E-mail address: cuit@hit.edu.cn

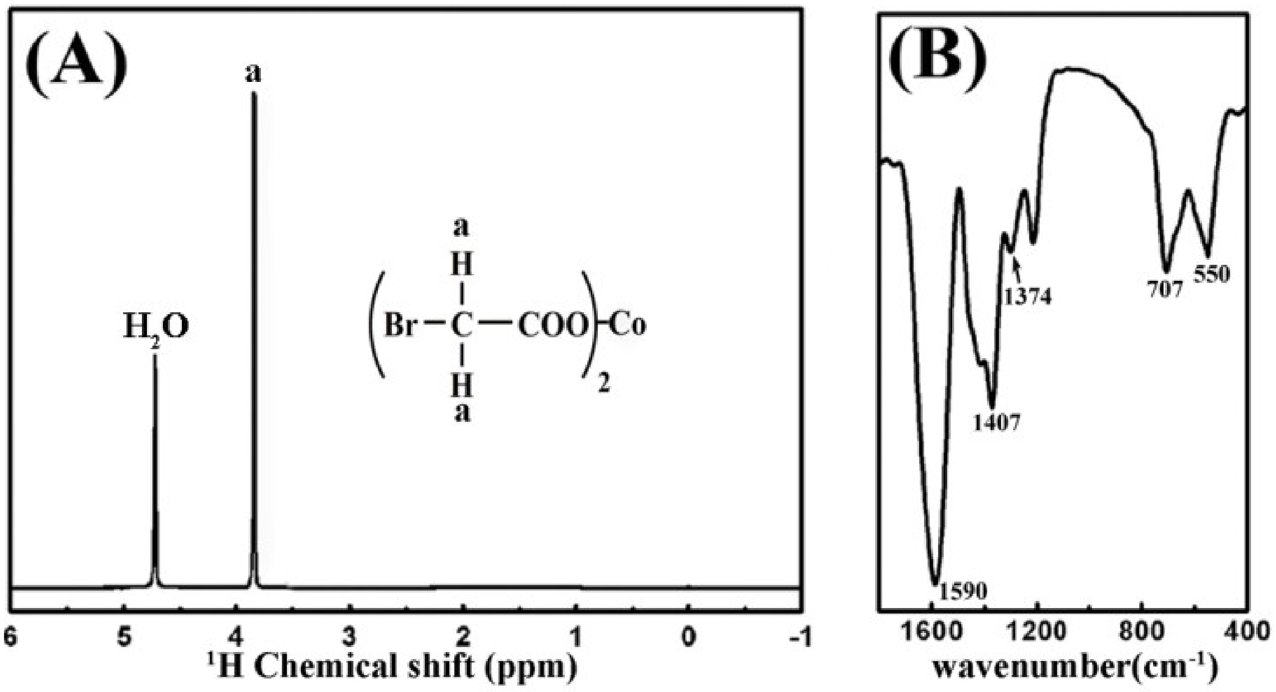

Figure.S1.^{1}H-NMR spectrum (A) and FT-IR spectra (B) of Co(BA)$_2$

Figure.S1 shows the ^{1}H-NMR spectrum (A) and FT-IR spectra (B) of Co(BA)$_2$, in the ^{1}H-NMR spectrum (**Figure.S1A**), the chemical shift 3.89 ppm is assigned to the protons on β-C. FT-IR spectra (**Figure.1B**) indicates three strong bands of carboxylate groups at 1590cm^{-1}, 1374cm^{-1} and 707 cm^{-1} are antisymmetric stretching vibration, symmetric stretching vibration and deformation vibration, respectively. The absorption peak at 1407cm^{-1} is assigned to the variable-angle vibration of the -CH$_2$- groups and 550cm^{-1} is C-Br vibration.

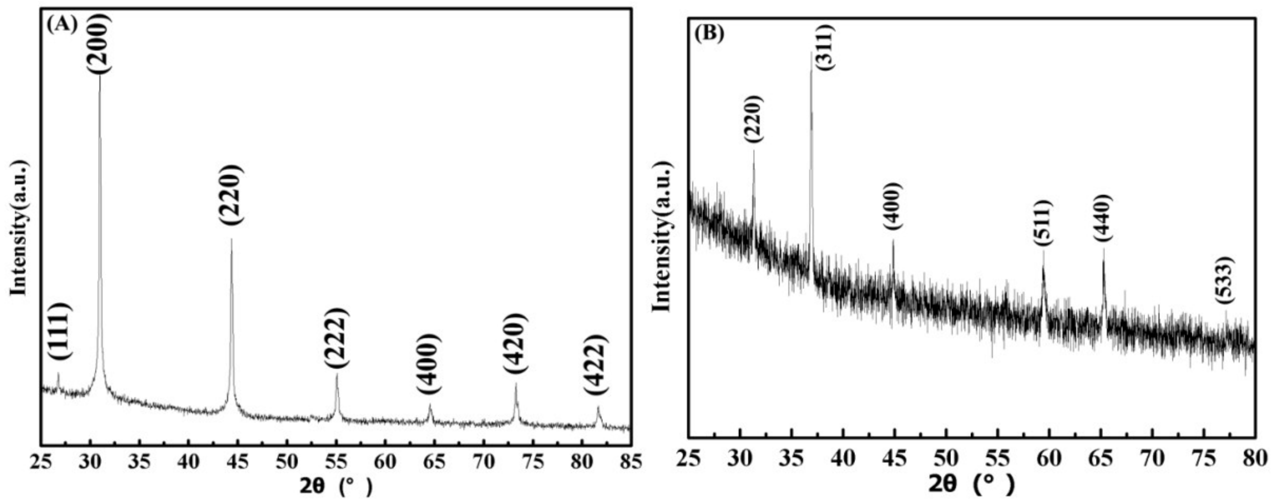

Figure.S2 XRD pattern of AgBr-CoBA$_2$@SiO$_2$ composites(A) and Co$_3$O$_4$@SiO$_2$ composites(B)

The XRD pattern of the as-obtained AgBr-CoBA$_2$@SiO$_2$ composites (**Figure.S2A**) shows seven well-resolved diffraction peaks in the range of 25-90°, which can be indexed to the (111), (200),(220), (222), (400), (420) and (422) reflections of AgBr (JCPDS NO. 790149), which confirmed that Ag$^+$ ions combined with Br$^-$. **Figure.S2B** shows the XRD pattern of Co$_3$O$_4$@SiO$_2$ composites, all peaks appear are indexed to face-centered cubic structure of Co$_3$O$_4$ spinel phase (JCPDS no.761802).

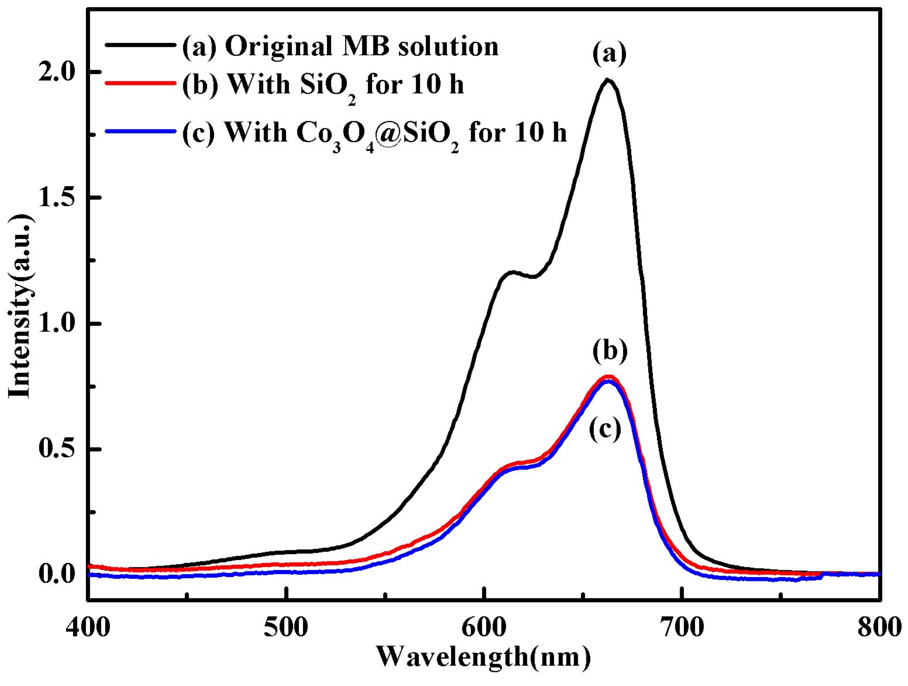

Figure.S3 UV-Vis spectra of original MB dye solution (a); mixture solution of MB dye and NaBH$_4$ after reaction for 10 h in the presence of pure SiO$_2$ (b) and mixture solution of MB dye and NaBH$_4$ after reaction for 10 h in the presence of Co$_3$O$_4$@SiO$_2$(c)

We prolonging the reaction time of the mixture solution of MB dye and $NaBH_4$ in the presence of pure SiO_2 and $Co_3O_4@SiO_2$ composites to 10 h, respectively, as 59.7% and 61.3% concentration decrease was observed, indicating that the adsorption of SiO2 and the catalytic activity of Co3O4@SiO2 composites is not the critical factor for reduction of the initial MB dye solution concentration.

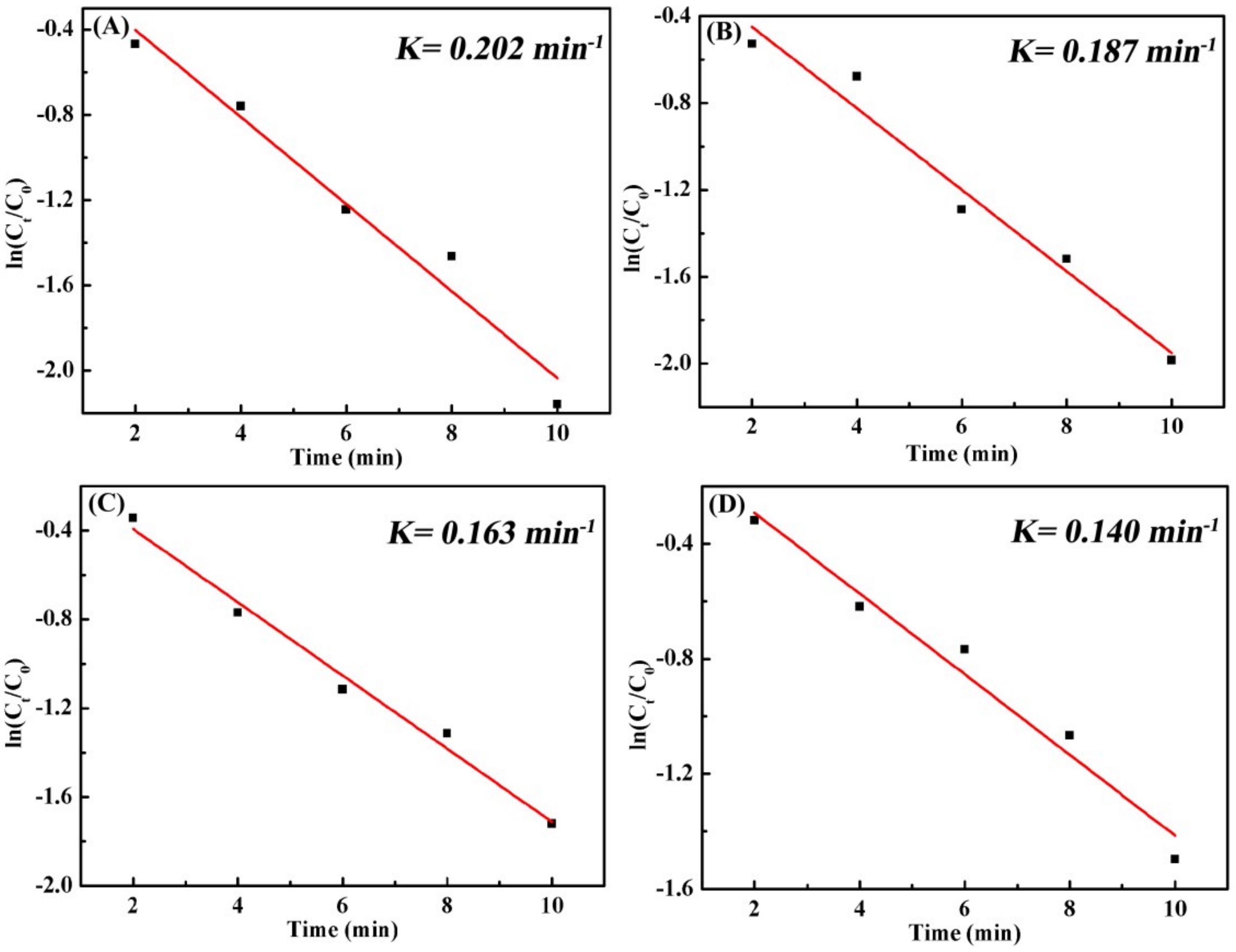

Figure.S4 The rate constant *k* estimated by the slopes of straight lines of ln*(At/A0) vs.* reduction time using 0.1 mg catalysts at different reused circles: (A) 2nd; (B) 3rd; (C) 4th; and (D) 5th. Here, the time that catalytic reaction started is set as the beginning time (t= 0).

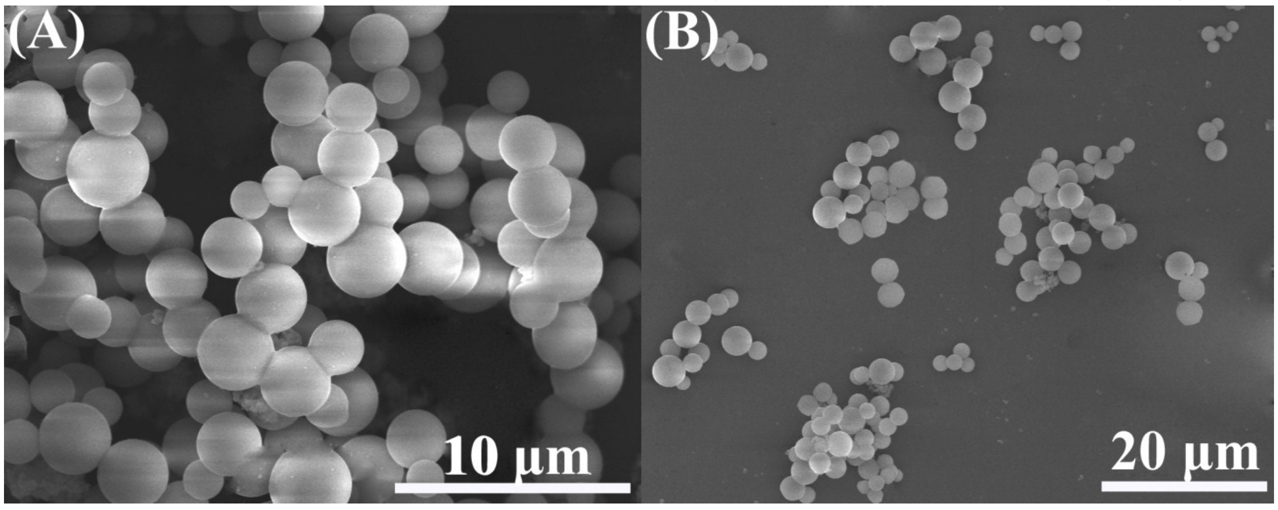

Figure.S5 SEM images of $AgBr\text{-}CoBA_2@SiO_2$ (A) and $Ag\text{-}Co_3O_4@SiO_2$ (B)

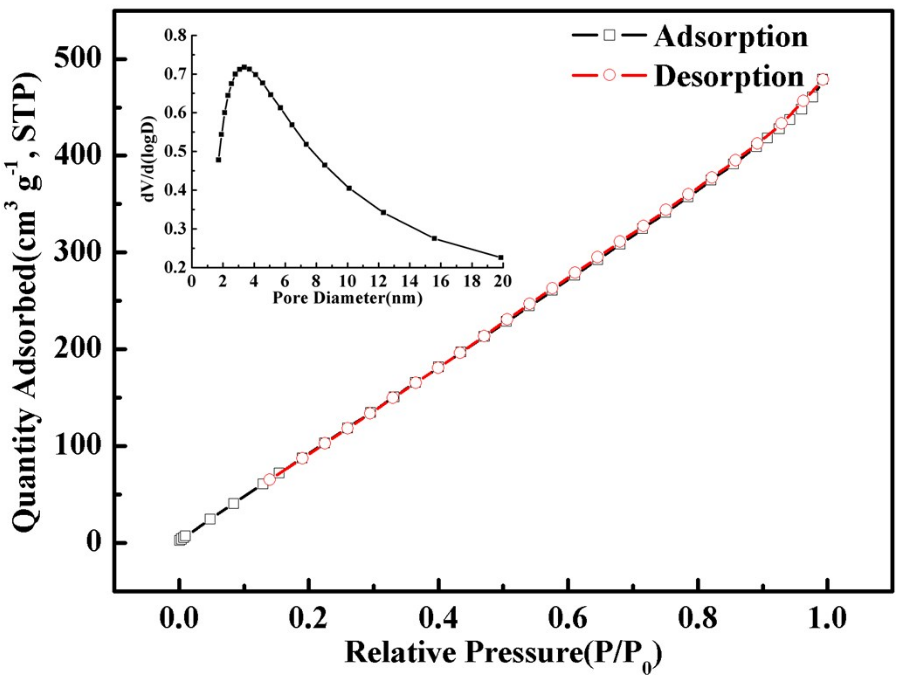

Figure S6 The N_2 adsorption-desorption isotherms and pore size distribution of $Ag\text{-}Co_3O_4@SiO_2$ nanocomposites

The BET surface area of $Ag\text{-}Co_3O_4@SiO_2$ nanocomposites is 726m^2/g, and the pore size distribution exhibits a sharp peak centered at the mean value of ~3.9 nm.

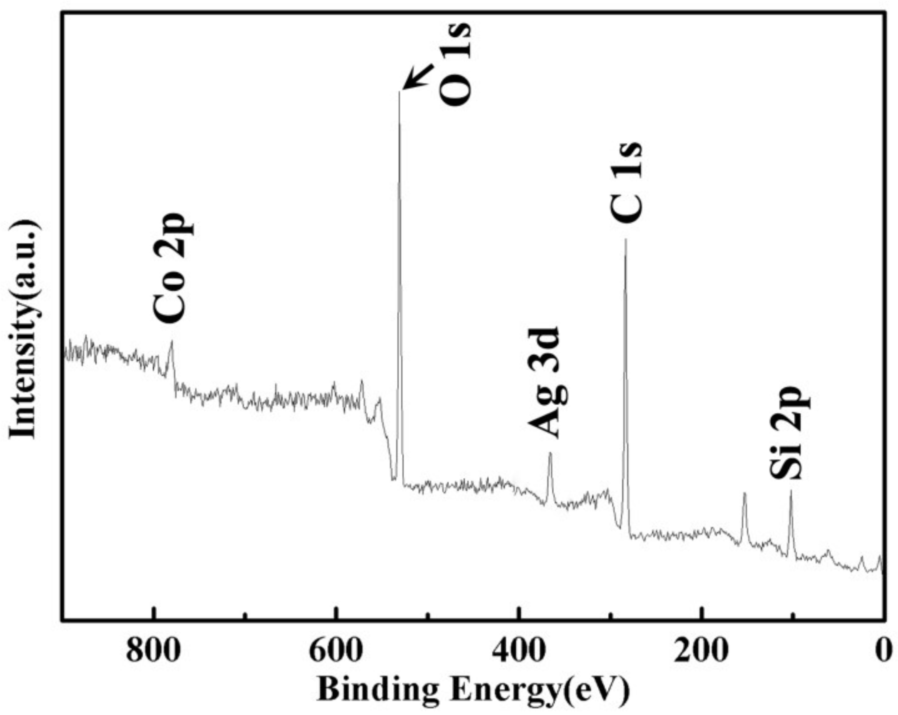

Figure.S7 XPS spectra of the Ag-Co_3O_4@SiO_2 nanocomposites

The X-ray photoelectron spectra (XPS) of the Ag-Co_3O_4@SiO_2 composites shown in **Figure.S7** demonstrated that there are tiny amounts of Ag NPs decorated on the surface of silica.