

Electronic Supplementary Information for

**Controlled Synthesis of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> Nanostructures by Ionic Liquid and  
Their Distinct Photocatalytic Performances under Visible-light  
Irradiation**

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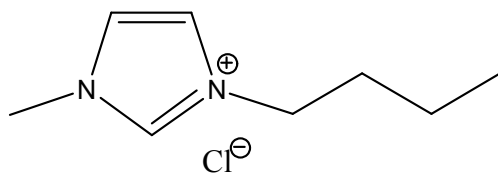
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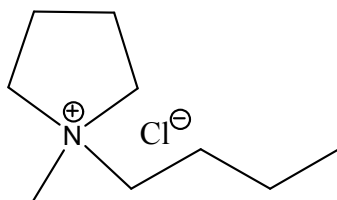
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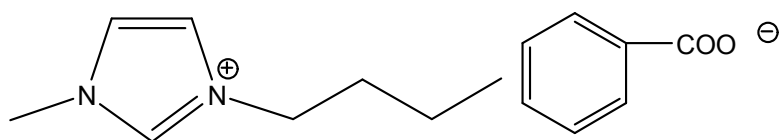
1-butyl-3-methylimidazolium chloride

a: [Bmim]Cl



1-butyl-1-methylpyrrolidinium chloride

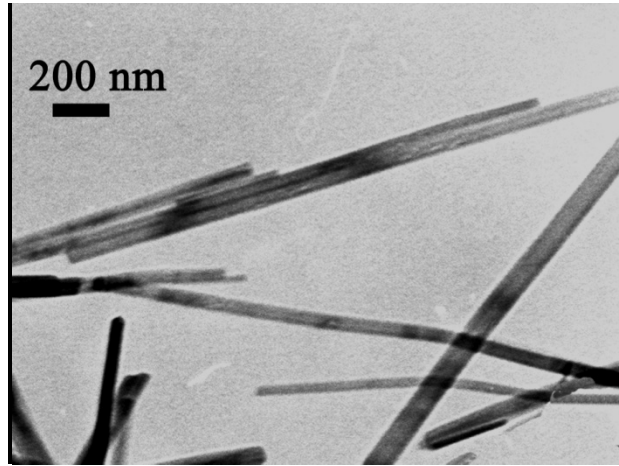
b: [Bmpyr]Cl



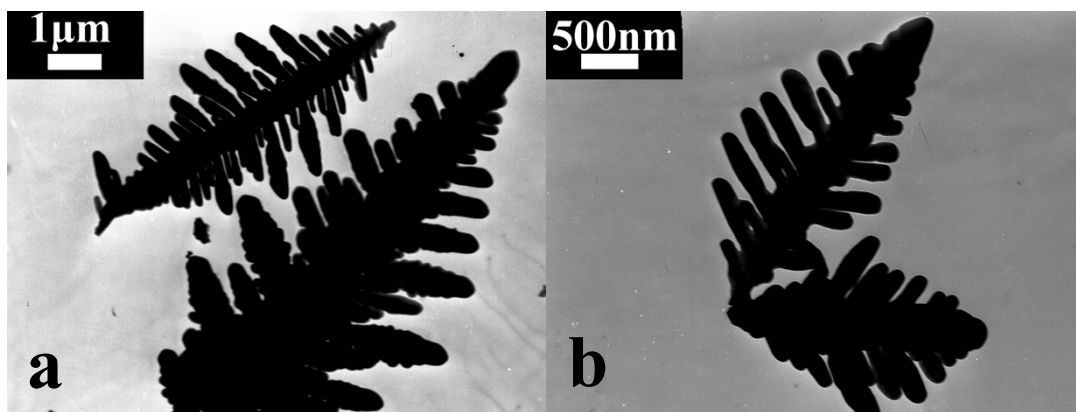
1-butyl-3-methylimidazolium benzoate

c: [Bmim][PhCOO]

**Fig. S1.** Molecular structures of the three ionic liquids. (a) [Bmim]Cl, (b) [Bmpyr]Cl, (c) [Bmim][PhCOO].



**Fig. S2.** TEM image of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> rod II.



**Fig. S3.** TEM images of obtained  $\alpha$ - $\text{Fe}_2\text{O}_3$  nanocrystals from PhCOONa with different molar ratios of PhCOONa to  $\text{K}_3\text{Fe}(\text{CN})_6$ . (a) 2:1, (b) 5:1.

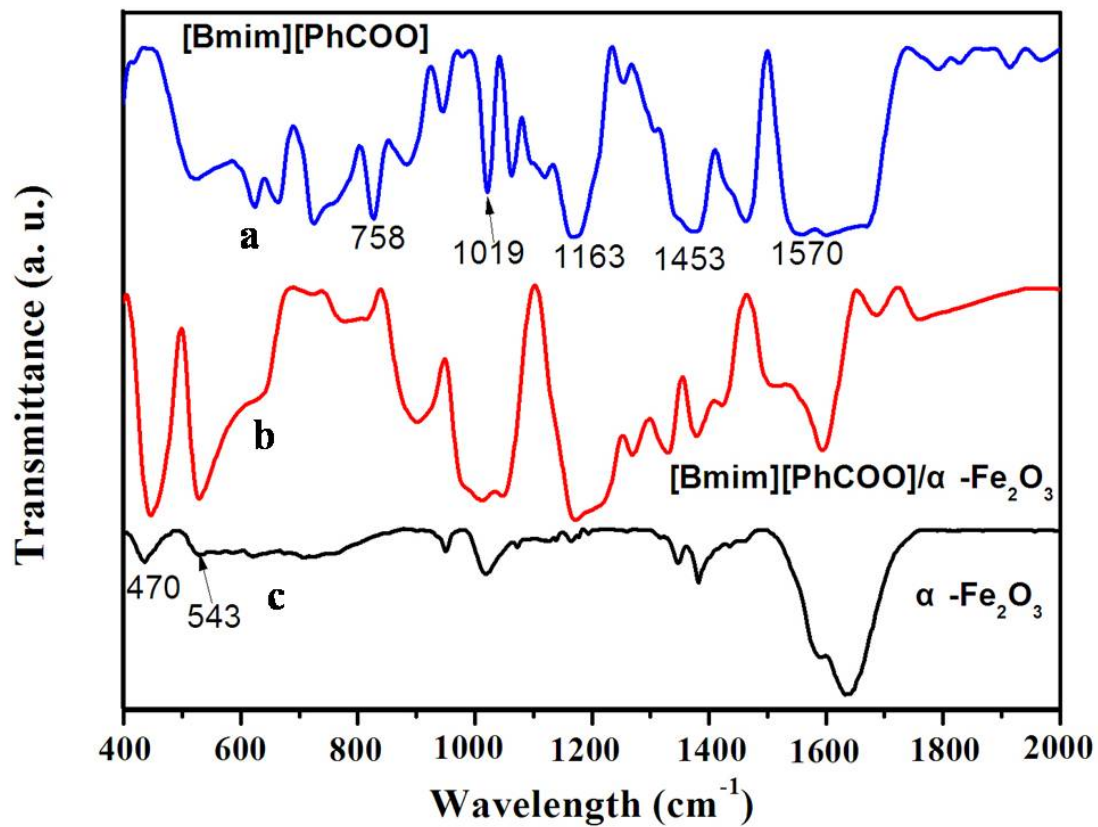


Fig. S4. FT-IR spectra of (a) pure [Bmim][PhCOO], (b) [Bmim][PhCOO]/ $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>, (c)  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>.

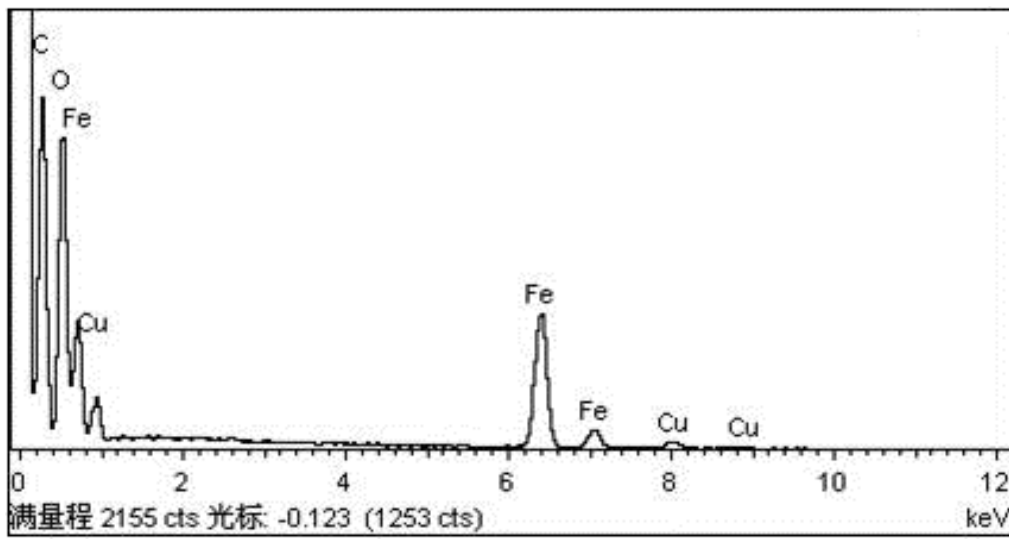


Fig. S5. EDS spectra of the obtained  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> after washing several times with distilled water and anhydrous alcohol.

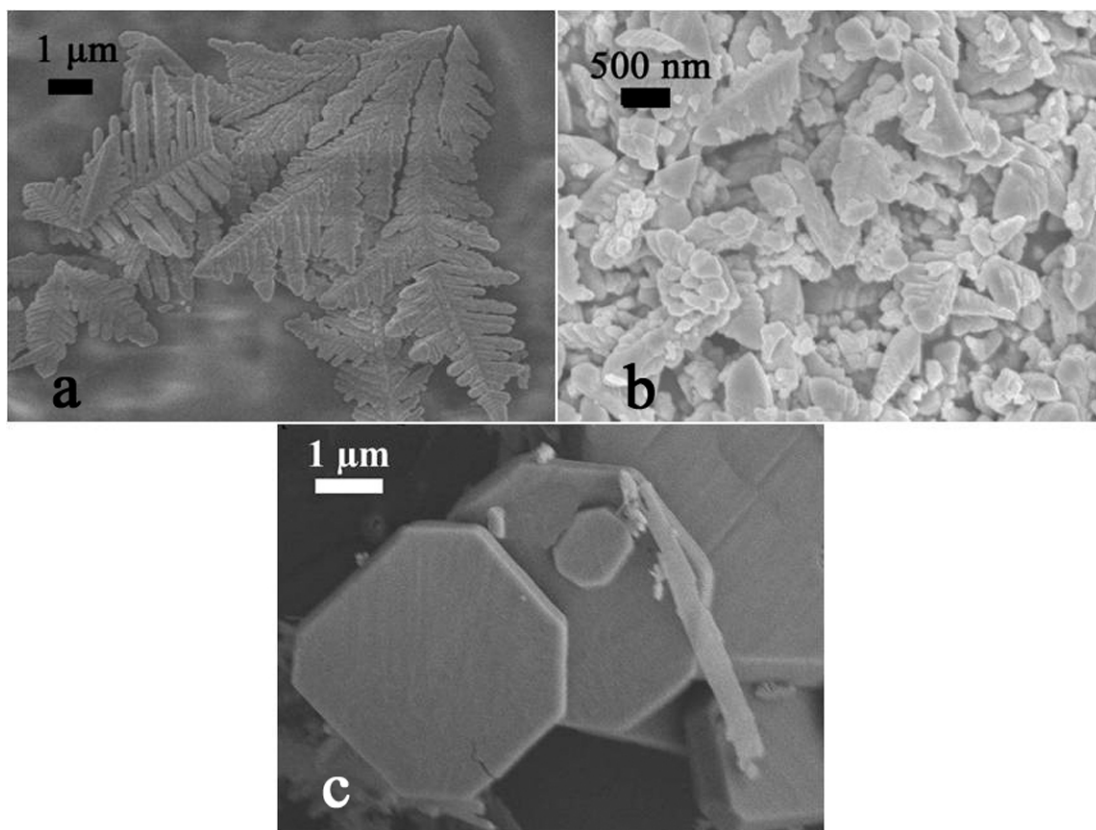
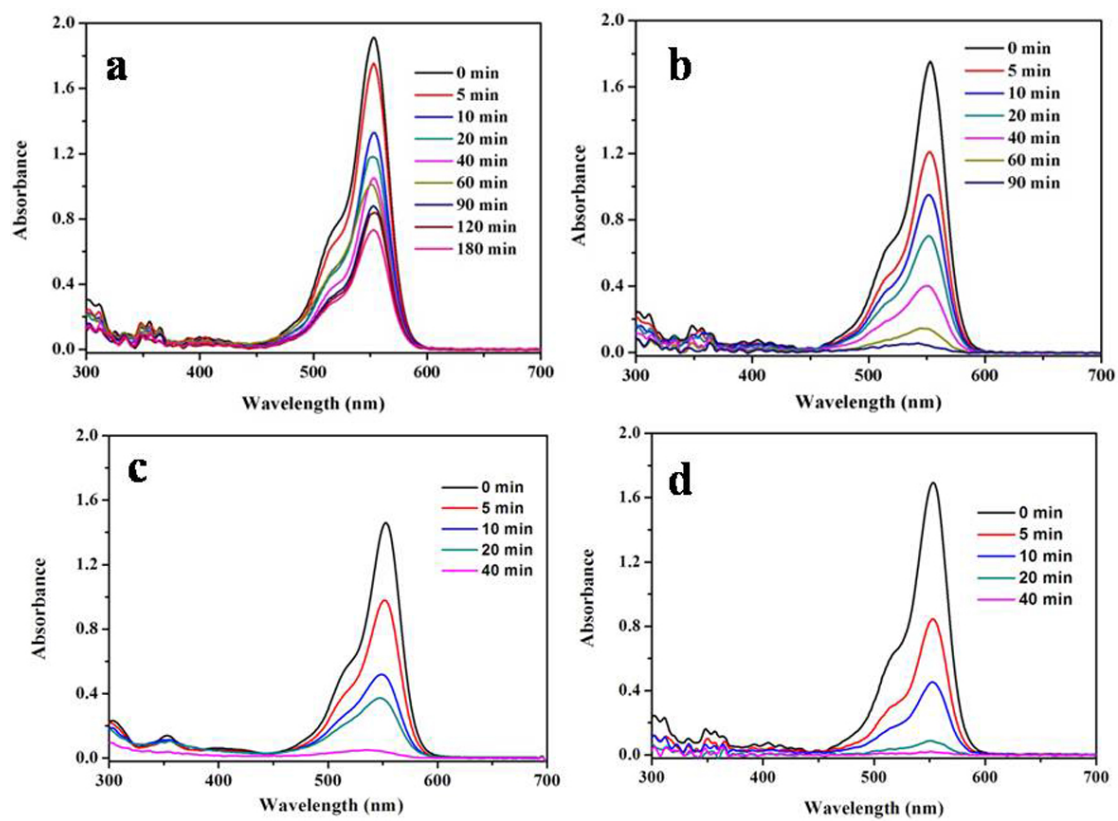
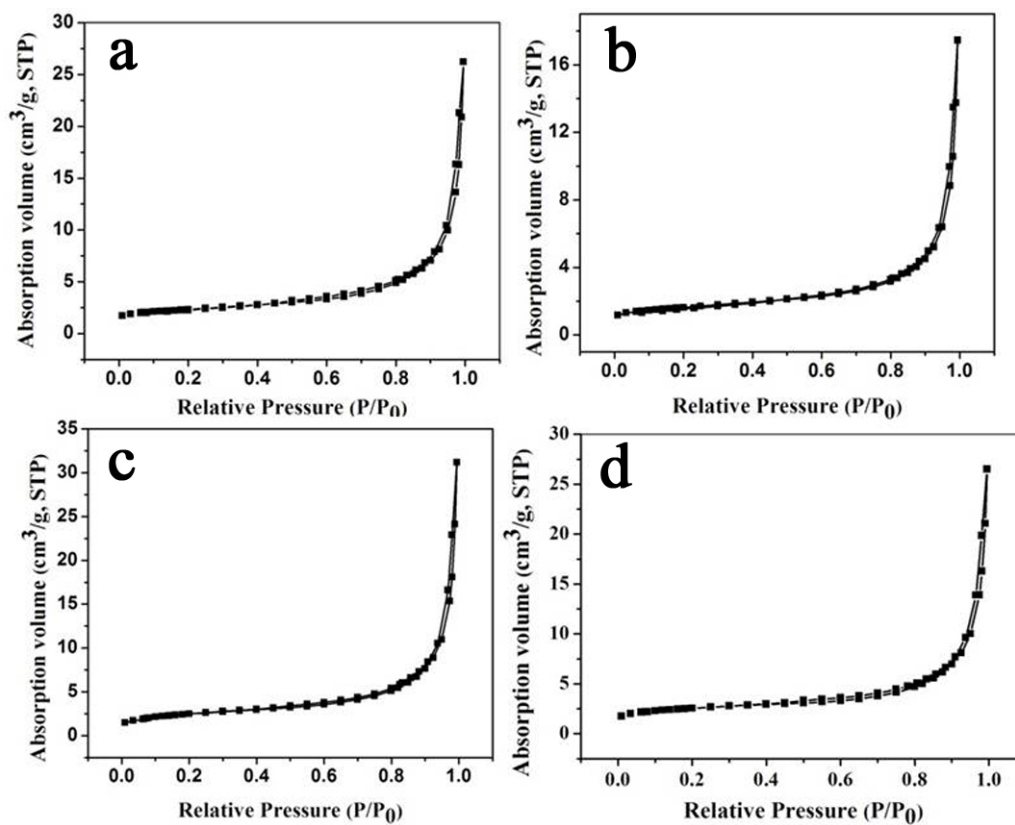


Figure S6. SEM images of the  $\alpha$ - $\text{Fe}_2\text{O}_3$  crystals obtained in lower ratios  $r$ . (a)  $r = 0.2:1$ , (b)  $r = 0.5:1$ , (c)  $r = 1:1$ .



**Fig. S7.** UV-vis spectral changes of RhB aqueous solutions as a function of time in the presence of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> nanocrystals and H<sub>2</sub>O<sub>2</sub> additive. (a) dendrite, (b) plate, (c) rod I, (d) rod II.





**Fig. S8.** Nitrogen adsorption-desorption isothermal for different  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> nanocrystals. (a) dendrite, (b) plate, (c) rod I, (d) rod II.