

## Electronic Supplementary information

### Peroxidase Mimic Activity of Hematite Iron Oxides ( $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>) with Different Nanostructures

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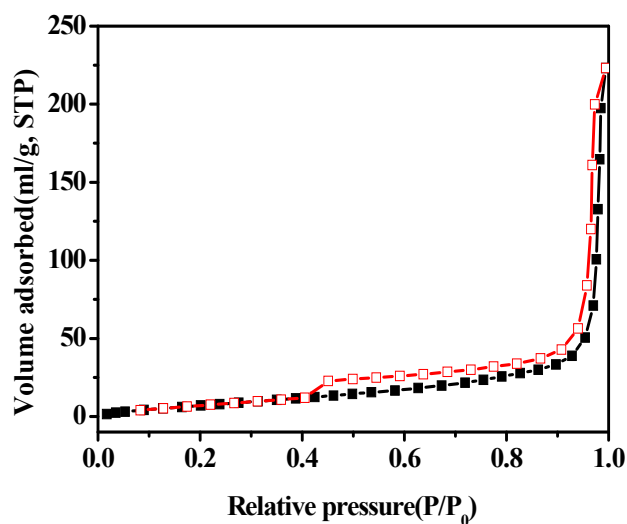


Fig. S1 N<sub>2</sub> adsorption-desorption isotherms for hexagonal prism  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>.

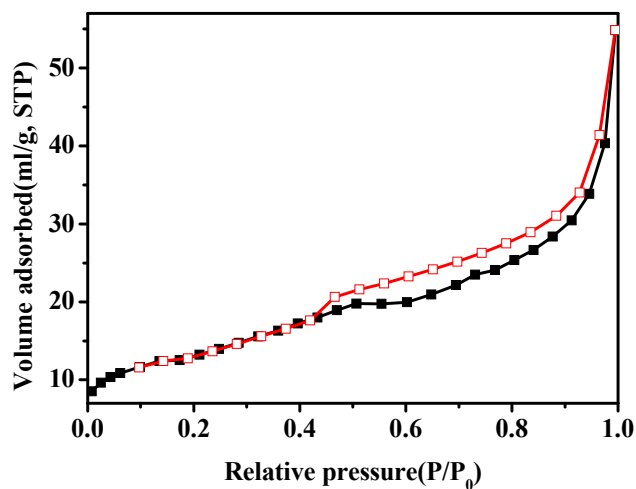


Fig. S2 N<sub>2</sub> adsorption-desorption isotherms for cube-like  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>.

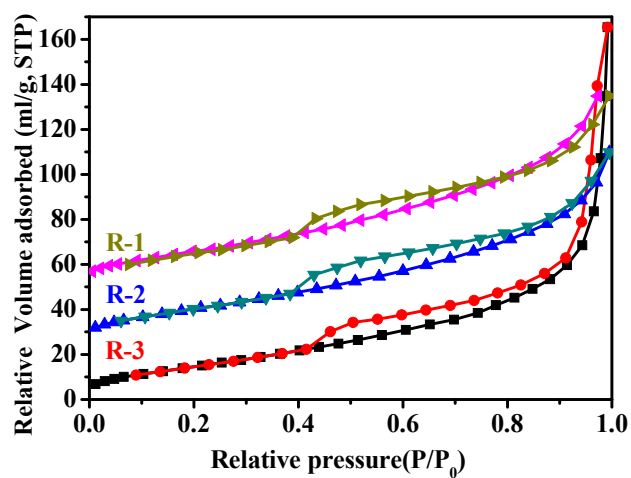


Fig. S3  $\text{N}_2$  adsorption-desorption isotherms for R-1, R-2 and R-3 rod shaped  $\alpha$ - $\text{Fe}_2\text{O}_3$ .

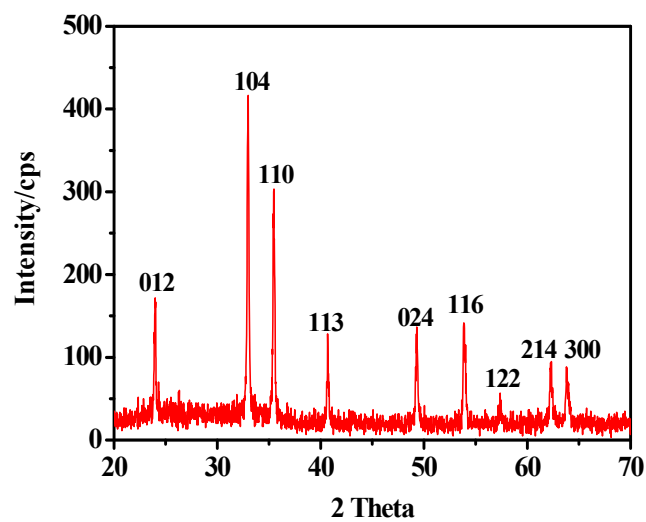


Fig. S4 XRD patterns of the hexagonal prism-like hematite  $\alpha$ - $\text{Fe}_2\text{O}_3$ .

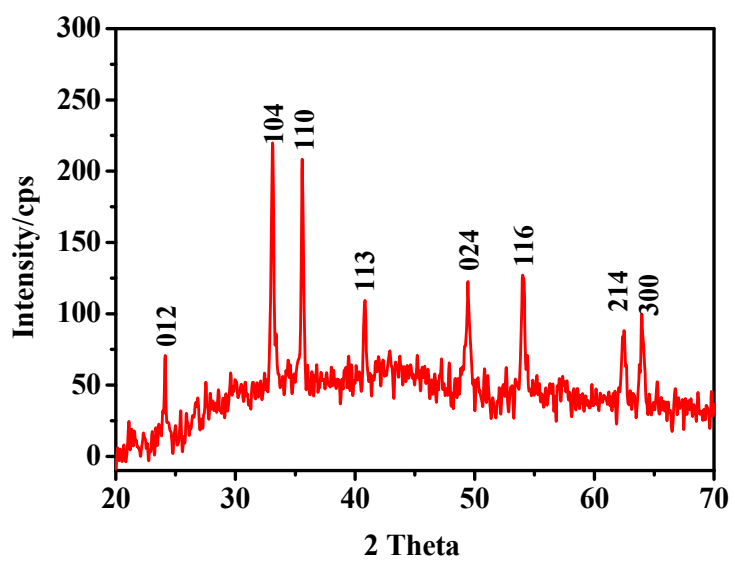


Fig. S5 XRD pattern of the cube-like hematite  $\alpha\text{-Fe}_2\text{O}_3$ .

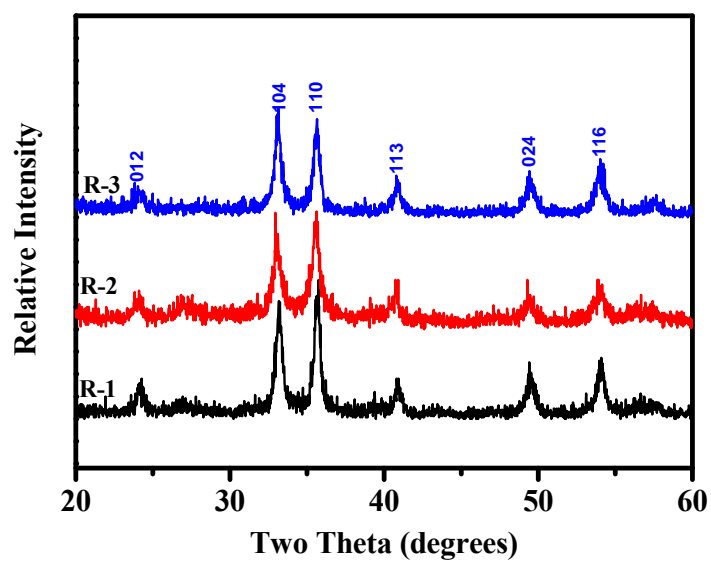
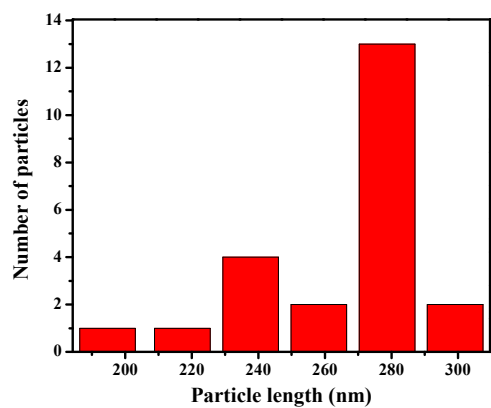
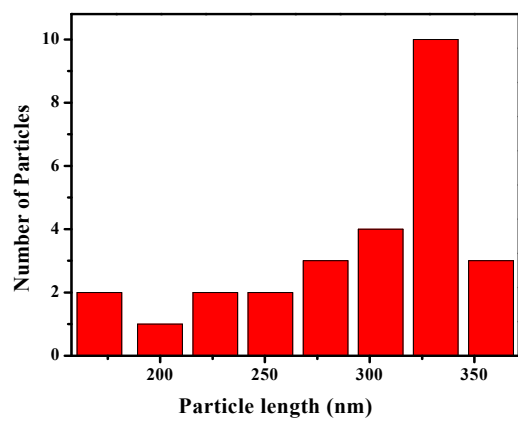
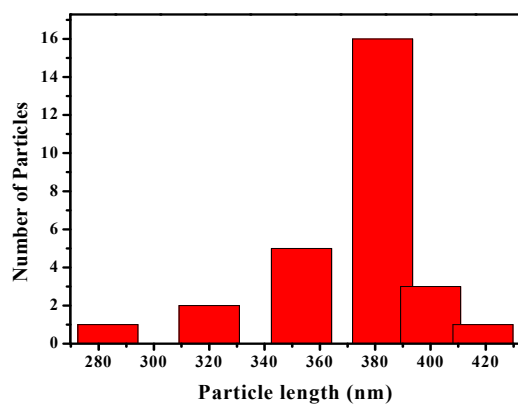
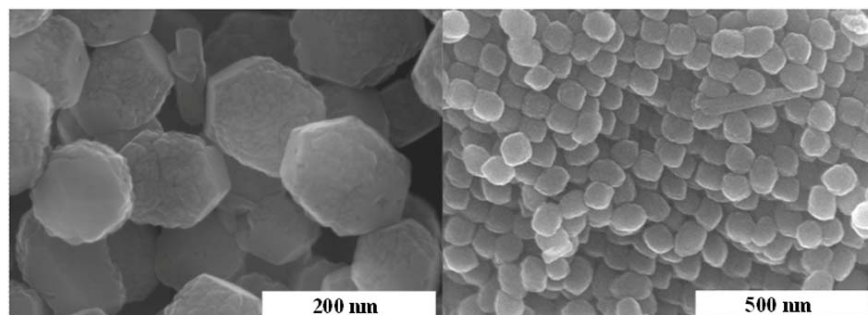


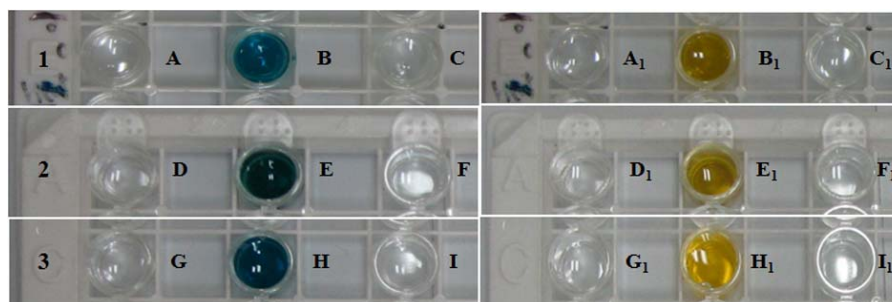
Fig. S6 XRD pattern of the R-1, R-2, and R-3 rod shaped  $\alpha\text{-Fe}_2\text{O}_3$ .



**Fig. S7** Length distributions in R-1 (top), R-2 and R-3 (bottom).



**Fig. S8** Scanning electron microscopy images of  $\alpha\text{-Fe}_2\text{O}_3$  hexagonal prism and cube-like nanoparticles.



**Fig. S9** Peroxidase enzyme-like activity of different  $\alpha\text{-Fe}_2\text{O}_3$  rod shaped nanoparticles. Sequentially R-3, R-2, and R-1 with blue color development after 30 min and yellow color development immediately after stopping the reaction with 2.0 mol sulphuric acid. (A/A<sub>1</sub>, D/D<sub>1</sub>, G/G<sub>1</sub>) TMB in citrate buffer with  $\alpha\text{-Fe}_2\text{O}_3$  nanoparticles and no  $\text{H}_2\text{O}_2$  (control-1), (B/B<sub>1</sub>, E/E<sub>1</sub>, H/H<sub>1</sub>,) TMB in citrate buffer with both  $\alpha\text{-Fe}_2\text{O}_3$  nanoparticles and  $\text{H}_2\text{O}_2$ , and (C/C<sub>1</sub> F/F<sub>1</sub>, I/I<sub>1</sub>) TMB in citrate buffer with  $\text{H}_2\text{O}_2$  and no  $\alpha\text{-Fe}_2\text{O}_3$  nanoparticles (Control-2).