

# pH and Magnetism Dual-Responsive Pickering Emulsion Stabilized by Dynamic Covalent Fe<sub>3</sub>O<sub>4</sub> Nanoparticles

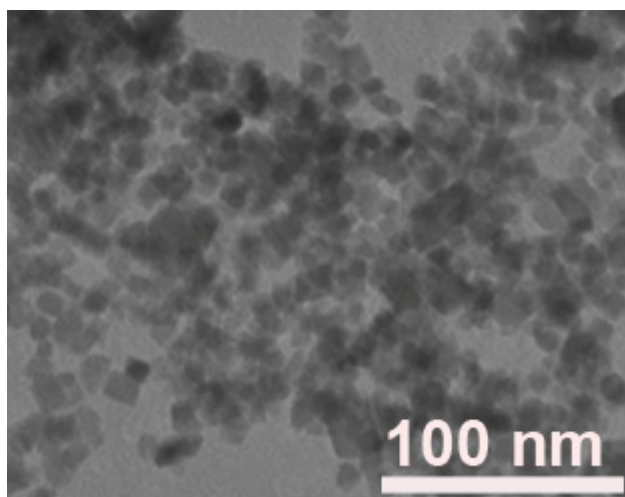
Gaihuan Ren <sup>1,\*</sup>, Zhanzhao Li <sup>1</sup>, Dongxu Lu <sup>2</sup>, Bo Li <sup>1</sup>, Lulu Ren <sup>3</sup>, Wenwen Di <sup>3</sup>, Hongqin Yu <sup>1</sup>, Jianxin He <sup>1</sup>, and Dejun Sun <sup>3</sup>

<sup>1</sup> Textile and Garment Industry of Research Institute, Zhongyuan University of Technology, Zhengzhou 450007, China; 2021117608@zut.edu.cn (Z.L.); 2020110366@zut.edu.cn (B.L.); 3812@zut.edu.cn (H.Y.); 5269@zut.edu.cn (J.H.)

<sup>2</sup> School of Mechanical and Electrical Engineering, Zhengzhou University of Industrial Technology, Zhengzhou 450007, China; tian543669@163.com

<sup>3</sup> Key Laboratory of Colloid and Interface Chemistry, Ministry of Education, Shandong University, Jinan 250100, China; 201912144@mail.sdu.edu.cn (L.R.); 201832281@mail.sdu.edu.cn (W.D.); djsun@zut.edu.cn (D.S.)

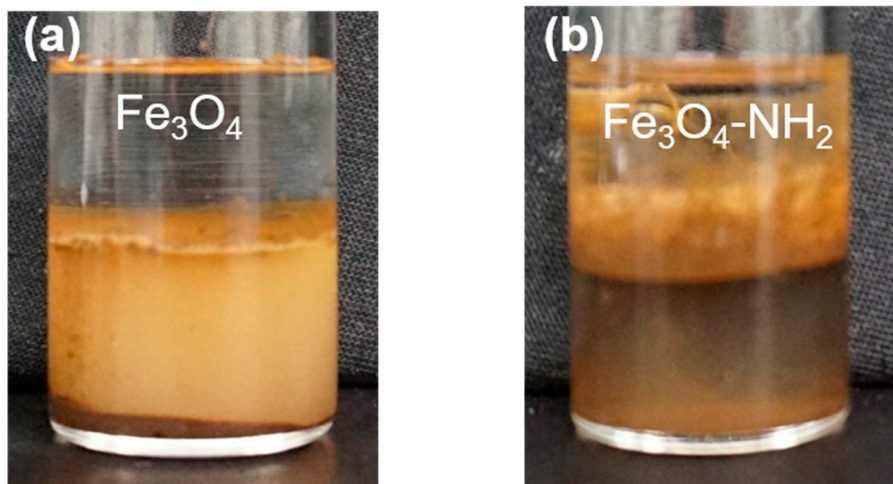
\* Correspondence: ghren@zut.edu.cn



**Figure S1.** TEM image of DC-Fe<sub>3</sub>O<sub>4</sub>.



**Figure S2.** Photograph of DC-Fe<sub>3</sub>O<sub>4</sub> nanoparticles partitioning at oil-water interface. The aqueous phase was stained with RbB.



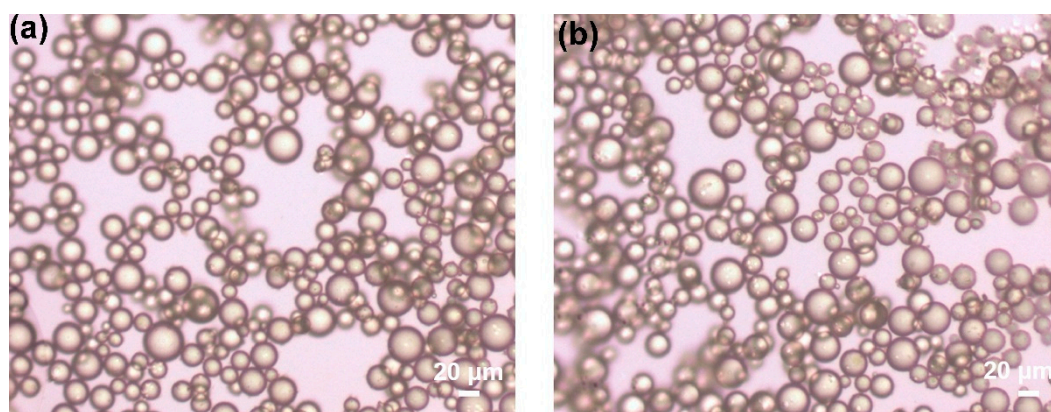
**Figure S3.** Photographs of liquid paraffin in water Pickering emulsions stabilized by 1.0 wt%  $\text{Fe}_3\text{O}_4$  (a), 1.0 wt%  $\text{Fe}_3\text{O}_4\text{-NH}_2$  (b) at pH 10, taken 30 min after preparation.



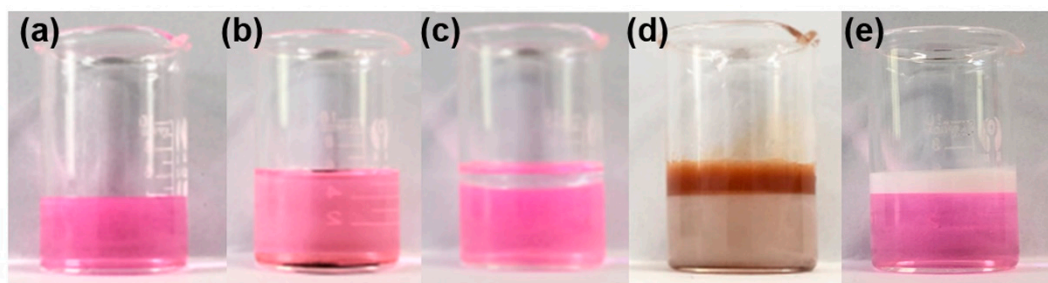
**Figure S4.** Photograph of the liquid paraffin and water after sonication for 2 min without DC- $\text{Fe}_3\text{O}_4$  nanoparticles.



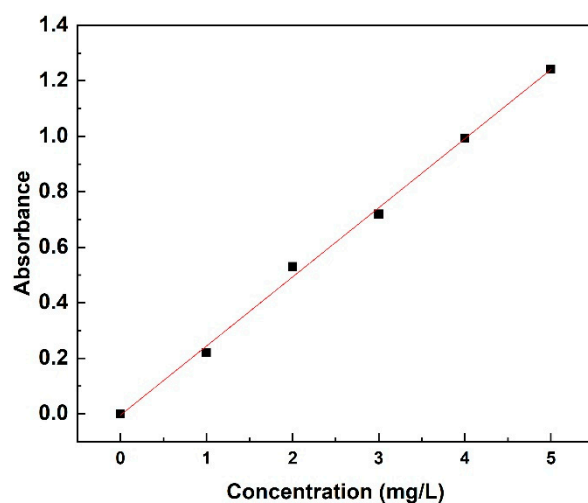
**Figure S5.** Image of contact measurement of acidic water droplet (pH = 2) on the DC- $\text{Fe}_3\text{O}_4$  film.



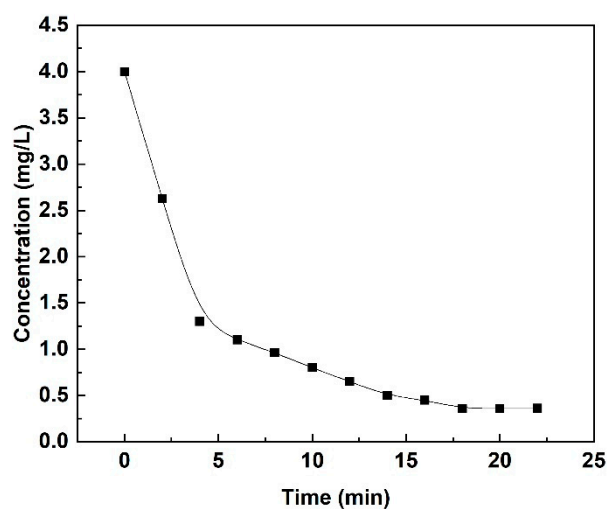
**Figure S6.** Optical micrographs of initial Pickering emulsion and after 3 cycles are shown in (a) and (b), respectively. Pickering emulsion was prepared with 1.0 wt% DC-Fe<sub>3</sub>O<sub>4</sub> at pH 10. The liquid paraffin and water were in an equal volume ratio.



**Figure S7.** Photographs of 4 mg/L rhodamine B solution (a), the extraction of rhodamine B solution with DC-Fe<sub>3</sub>O<sub>4</sub> nanoparticles (b), the extraction rhodamine B solution with liquid paraffin (c), extraction of rhodamine B solution with DC-Fe<sub>3</sub>O<sub>4</sub> stabilized oil in water Pickering emulsion (d), and extraction of rhodamine B solution with AES stabilized oil in water emulsion (e).



**Figure S8.** Standard curve of rhodamine B.



**Figure S9.** The change of RhB concentration with standing time after adding 1 mL Pickering emulsion into 4 mL RhB aqueous solution. The initial concentration of RhB is 4 mg/L. The Pickering emulsion was stabilized by 1 wt% DC-Fe<sub>3</sub>O<sub>4</sub> and the volume ratio of liquid paraffin and water is 1:1.