

Electronic Supplementary Information

The double influence mechanism of pH to the arsenic removal by nano zero valent iron: electrostatic interactions and the corrosion of Fe⁰

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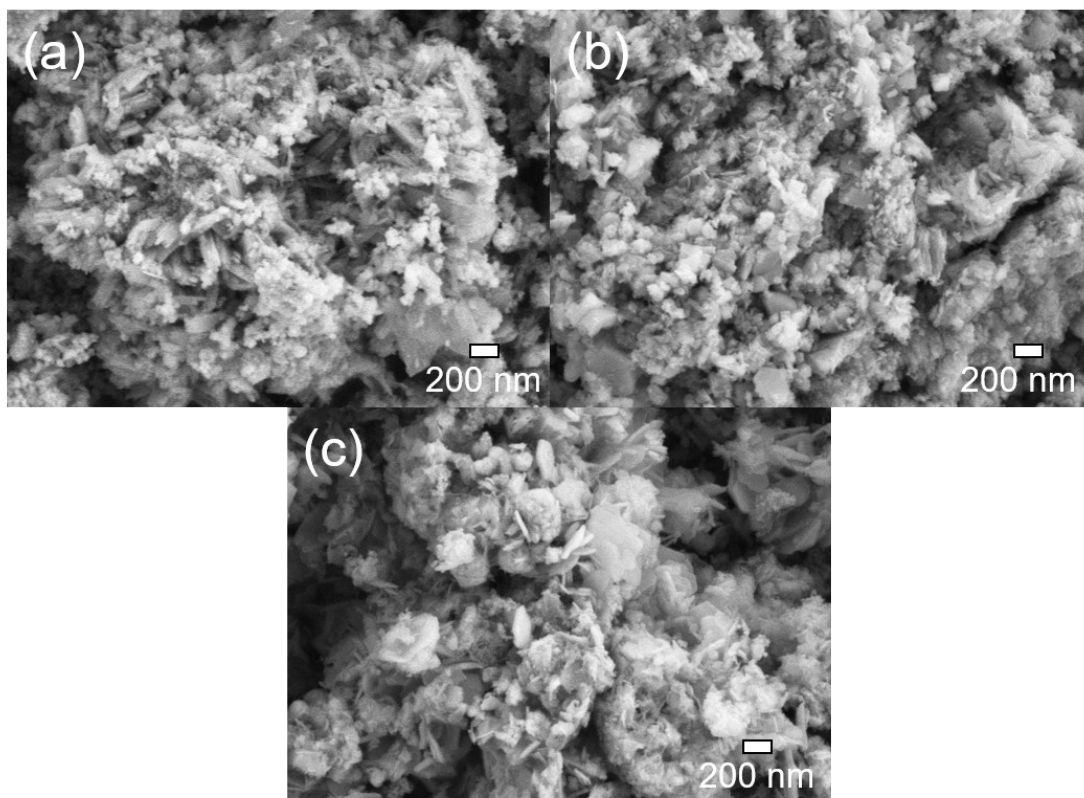


Fig.S1 SEM image of nZVI after corrosion at pH 4 (a), 7 (b), and 10 (c).

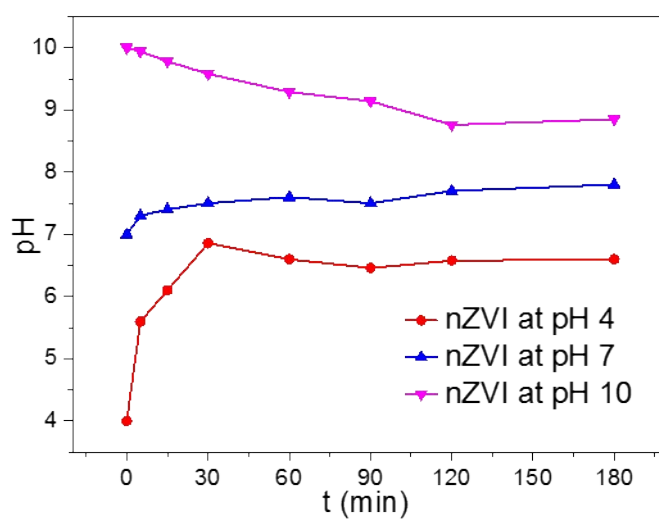


Fig.S2 Evolution of solution pH during As(V) removal by nZVI with initial solution pH of 4, 7 and 10.

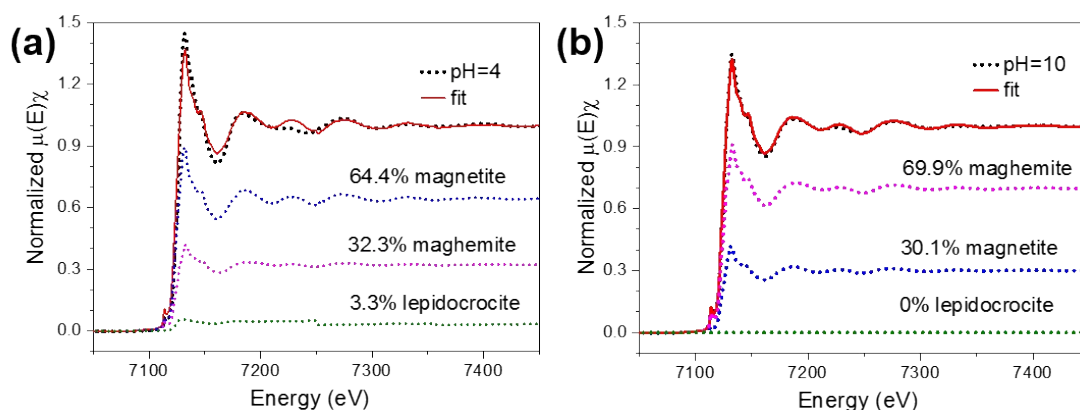


Fig.S3 Fe k-edge XANES spectra and linear combination fits (LCF) of As(V)-treated nZVI at initial pH 4.0 (a) and 10.0 (b).

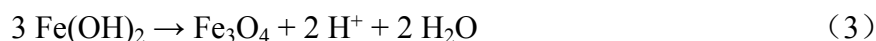
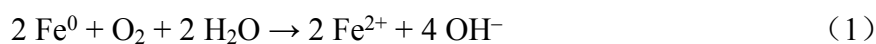
It is worthy to point out that the corrosion mechanism of nZVI is a complex scientific issue, which is not only related to pH but also related to the coexisting specific ions. Therefore, the corrosion mechanism of nZVI in deionized water may not represent the real situation of nZVI with the coexisting of pollutants. Various work should be done to disclose the phase contents of nZVI under different pH with the coexisting of different pollutants.

The corrosion mechanism of nZVI at vary pH.

The increasing pH value condition would decreases the lepidocrocite content but increases the magnetite/maghemite content in the corrosion products of nZVI. Which has been reported in the previous study. The study by Dong¹ shows that, at pH 5, the corrosion products of nZVI main is lepidocrocite, and at pH 10, the main corrosion products of nZVI is magnetite/maghemite.

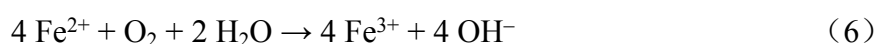
The corrosion mechanism of nZVI is a complex scientific issue. How pH affects the formation of the oxide layer at the nZVI surface is not fully understood, thus more research is needed to study the effect of pH on metal removal by nZVI to determine the specific impact on each removal mechanism. Therefore, the corrosion mechanism of nZVI has been speculated.

Under basic condition, the formation mechanism of magnetite/maghemite could be shown as follows ^{2,3}:



Obviously, the basic condition accelerates the consumption of H^+ in equal (3), which is in favor of the formation of Fe_3O_4 and Fe_2O_3 .

Under acidity condition, the formation mechanism of lepidocrocite could be shown as follows⁴:



The acidity condition accelerates the consumption of OH^- in equal (6), which is in favor of the formation of FeOOH .

(1) Dong, H.; Guan, X.; Lo, I. M. C. *Water Res.* 2012, **46**, 4071–4080.

(2) Satapanajaru, T.; Shea, P. J.; Comfort, S. D.; Roh, Y. *Environ. Sci. Technol.* 2003, **37**, 5219–5227.

(3) Mu, Y.; Jia, F.; Ai, Z.; Zhang, L. *Environ. Sci. Nano* 2017, **4**, 27–45.

(4) Mondal, P.; Bhowmick, S.; Jullok, N.; Ye, W.; Van Renterghem, W.; Van den Berghe, S.; Van der Bruggen, B. *J. Phys. Chem. C* 2014, **118**, 21614–21621.