Supplementary Information

Mg-doping: a facile approach to impart enhanced arsenic adsorption performance and

easy magnetic separation capability to *α*-Fe₂O₃ nanoadsorbents

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The total arsenic concentration determination in natural water samples

The total arsenic concentration could be determined by inductively coupled plasma-mass spectrometry (ICP-MS), atomic absorption spectrometry (AAS), or atomic fluorescence spectrometry (AFS).¹ The measurement methods based on AAS or AFS coupled with vapor generation techniques such as hydride generation (HG) could offer a low-cost alternative to ICP-MS. Because the sensitivities differ among hydride-forming As species, each species may exhibits a different peak height for the same As concentration. Thus, it is desirable to first convert arsenic species into a single species (either As(III) or As(V),¹ so a single hydride could be generated for detection and quantitation. A variety of pre-reduction agents, including sodium iodide with hydrochloric acid,² tartaric acid solution with hydrochloric hydroxylamine,³ thiourea with ascorbic acid, 4,5 and KI,⁶ were used in literature to prereduce As(V) to As(III). In our experiment, thiourea and ascorbic acid were used as the pre-reduction agent to reduce As(V) to As(III) in the natural water samples before measuring the total arsenic by an atomic fluorescence spectrophotometer (AFS-9800). Besides serving as the pre-reduction agent, thiourea and ascorbic acid could also serve as the masking agent on other ions in the solutions.

Tables:

	Mg (at %)	Fe (at %)	O (at %)	composition formula
ICP-MS analysis	3.97	36.89	59.14	$Mg_{0.27}Fe_{2.50}O_{4.00}$
XPS analysis	3.99	36.80	59.21	Mg _{0.27} Fe _{2.49} O _{4.00}

Table S1. Composition contents by ICP-MS and XPS analysis

Table S2. The adsorption capacity of the synthesized magnesium ferrite nanocrystallites and various reported iron oxides for arsenic removal

Adsorbents	рН	Arsenic equilibrium	Capacity (mg/g)		Poforoncos
		concentration (mg/L)	As(III)	As(V)	Kelelelices
Magnesium ferrite	7.0	0.005	9.3	10	Present study
α -Fe ₂ O ₃ NPs	7.0	0.005	5.6	6.9	7
Goethite	7.0	10	~	2.0	8
Hematite	4.2	10	~	0.20	9
Ferrihydrite	~	0.325	~	0.25	10
Iron oxide coated sand	7.6	0.1	0.041	0.043	11
Fe-Mn oxides	8.5	100	5.0	3.7	12

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Figures:



Figure S1. The SEM image, EDS, and elementary distribution map for FM10 sample.

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References

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